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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1888.

No. 146.

THE AMERICAN DIAMOND DRILL COMPANY,
APPELLANT,

vs.

THE SULLIVAN MACHINE COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR
THE SOUTHERN DISTRICT OF NEW YORK.

FILED OCTOBER 17, 1885.

accession 25893

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JUDD & DETWEILER, PRINTERS, WASHINGTON, JULY 19, 1888.

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1 [L. S.] The President of the United States of America to the Sullivan Machine Company, Greeting:

You are hereby commanded that you personally appear before the judges of the circuit court of the United States of America for the southern district of New York, in the second circuit court, in equity, on the first Monday of November, A. D. 1872, wherever the said court shall then be, to answer a bill of complaint exhibited against you in the said court by the American Diamond Drill Company, and do further and receive what the said court shall have considered in that behalf; and this you are not to omit under the penalty on you of two hundred and fifty dollars.

Witness Honorable Salmon P. Chase, Chief Justice of the Supreme Court of the United States, at the city of New York, on the 25th day of September, in the year one thousand eight hundred and seventy-two, and of the Independence of the United States of America the ninety-seventh.

KENNETH G. WHITE, *Clerk.*

KELLER & BLAKE,
Compl't's Sol'rs.

The defendants are required to enter their appearance in the above cause in the clerk's office of this court on or before the first Monday of November, 1872, or the bill will be taken *pro confesso* against them.

K. G. W., *Clerk.*

2 (Endorsement on subpœna:)

SOUTHERN DIST. OF NEW YORK, *ss:*

William Scott, of lawful age, being duly sworn, deposes and says that he did, on the 7th day of September, serve the within-named defendant, The Sullivan Machine Company, by delivering a true copy thereof to and leaving the same with E. T. Rice, attorney for said company, who accepted the same, and leaving the same with him at 39 & 41 Wall St., in the city of New York, at the same time exhibiting to him the within original writ.

(S'g'd) WM. SCOTT.

Subscribed and sworn to before me this 21st day of Nov., 1872.
[NOTARIAL SEAL.] (Signed) WM. H. BISHOP,
Notary Public, City of New York.

I hereby depute Wm. Scott to execute the within writ.
(S'g'd) GEORGE H. SHARPE,
U. S. Marshal.

Sept. 25, '72.

Filed Feb'y 6, 1873.

3 Circuit Court of the U. S., Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

To the honorable the judges of said court:

The American Diamond Drill Company, a corporation created and doing business under and by virtue of the laws of the State of New York and having their principal place of business in the city of New York, in said State, bring this their bill of complaint against The Sullivan Machine Company, a corporation organized and doing business under and by virtue of the laws of the State of New Hampshire and having their principal place of business at Claremont, in the said State.

And thereupon your orators complain and say that heretofore and before the 14th day of July, A. D. 1863, one Rudolphe Leschot, a citizen of Geneva, in the Republic of Switzerland, being the original and first inventor of a certain new and useful improved rock drill which had not been known or used by others before the invention thereof by him, and having made due application to the Commissioner of Patents of the United States for letters patent therefor and complied with all the provisions of the statute in such
4 case made and provided, obtained letters patent of the United States of America for said invention, bearing date the 14th day of July, A. D. 1863, signed by the Secretary of the Interior and countersigned and sealed with the seal of the Patent Office by the said Commissioner of Patents, all in due form of and according to law, whereby there was granted and secured unto the said Rudolphe Leschot, his heirs, administrators, or assigns, for the term of seventeen years from the date thereof, the full and exclusive right and liberty of making, using, and vending to others to be used the said invention, and the said letters patent, having been duly recorded, were issued and delivered to him, the said Rudolphe Leschot.

And your orators further show unto your honors that afterwards and before the 16th day of February, A. D. 1869, one Asahel J. Severance having, by mesne assignments, become the owner and holder of the said letters patent so as aforesaid granted and issued to the said Rudolphe Leschot, and believing the same to be inoperative by reason of a defective and insufficient description or specification to secure the whole of said invention, which said errors had been incorporated in said specification by inadvertence, accident, and mistake, and, without any fraudulent or deceptive intention, surrendered the said letters patent to the Commissioner of Patents and prayed that the same might be canceled and new letters patent granted to him as such assignee, on a new and corrected specification, for the same invention and for the residue of the term, then unexpired, for which said letters patent had been granted, and the said Asahel J. Severance having fully and in all respects complied with all the requirements of the law in that behalf, thereupon, and after due proceedings had, the said Commissioner of Patents canceled said original letters patent and on the 16th day of February, A. D. 1869, caused new and amended letters patent to be issued in lieu thereof, signed by the Secretary of the Interior and countersigned and sealed with the seal of the Patent Office by the said Commissioner of Patents, all in due form of and according to law, whereby there was granted and secured unto the said Asahel J. Severance, as such assignee as aforesaid, his heirs, administrators, or assigns, for the unexpired term of seventeen years from the 14th day of July A. D. 1863, the full and exclusive right and liberty of making, using, and vending to others to be used the said invention, and the said last-mentioned letters patent having been duly recorded were issued and delivered to him, the said Asahel J. Severance.

And your orators further show unto your honors that after the granting and issuing of the new and amended letters patent last above recited, and before the 26th day of October, A. D. 1869, the said Asahel J. Severance, believing the said last-mentioned letters patent to be inoperative by reason of a defective or insufficient description or specification, which errors had arisen from inadvertence and mistake, and without any fraudulent or deceptive intention, surrendered the same to the said Commissioner of Patents, and prayed the cancellation thereof, and that new and amended letters patent might be granted in lieu thereof on a new and corrected specification for the same invention, and for the residue of the period, then unexpired, for which said original letters patent, first hereinabove recited, had been granted; and that the said Asahel J. Severance having complied with all the requirements of the law in that behalf, thereupon, and after due proceedings, had the said Commissioner of Patents cancel said reissued letters patent, and caused other new and amended letters patent to be granted in lieu thereof, which said last-mentioned reissued letters patent are known and designated as reissue No. 3690, bear date the 26th day of October, A. D. 1869, are signed by W. T. Otto, acting Secretary of the Interior, and countersigned and sealed with the seal of the Patent Office by Samuel S. Fisher, Commissioner of Patents, and grant and secure unto the said Asahel J. Severance, assignee as aforesaid, his heirs, administrators, or assigns, for the term of seventeen years from the 14th day of July, A. D. 1863, the full and exclusive right and liberty of making, using, and vending to others to be used the said invention, which is entitled in said reissued letters patent a new and useful "Improved Rock Drill," and a description whereof is given in the schedule annexed to said letters patent and making part of the same, as by reference to said reissued letters patent, or to a duly authenticated copy thereof, here in court ready to be produced, will more fully and at large appear.

And your orators further show unto your honors that afterwards, and on the 2nd day of June, A. D. 1871, the said Asahel J. Severance and one William T. Holt, being then the sole and exclusive owners and holders of the said letters patent, so granted and reissued as above recited, by their respective deeds of assignment, duly executed and bearing date on the said 2nd day of June, A. D. 1871, assigned, sold, transferred, and set over unto your orators all right, title, and interest in, to, and under said letters patent and the several reissues thereof for, in, and throughout the State of New York and certain other places as mentioned and set forth in said deeds, respectively, as by reference to said deeds of assignment, here in court ready to be produced, will more fully and at large appear.

And your orators further show unto your honors that by virtue of the said two deeds of assignment they became and are now the sole and exclusive owners and holders of the said letters patent so granted and reissued as aforesaid, and of all the rights and privileges thereby granted and secured, or intended so to be, for, in, and throughout the State of New York.

That they verily believe and therefore charge the fact to be that the said Rudolphe Leschot was and is the original and first inventor of the said invention; that the same is of great utility and value, and that your orators will realize and receive large gains and profits therefrom if infringements by the defendants herein and his confederates be prevented.

Yet the defendants herein, well knowing the premises, but contriving and wrongfully intending to injure your orators and to de-
prive them of the gains, profits, and advantages which they
7 might and otherwise would have derived from the said in-
vention, have heretofore, at the city of New York, State of
New York and divers other places within the territory mentioned and included in said deeds of assignment to your orators hereinbefore referred to, and without the consent or allowance, but against the will, of your orators, manufactured and sold and are still manufacturing and selling, at said city of New York and divers other places, large quantities of rock drills constructed according to and containing and embodying the said invention, and your orators have reason to believe they will continue so to do, and are thereby causing your orators great and irreparable damage, and refuse to pay your orators any of the profits which they have derived from such unlawful manufacture and sale, or to desist therefrom; all which is in violation and infringement of said letters patent, so issued to said Asahel J. Severance as aforesaid, and of the exclusive rights of your orators under the same.

Which said actings and doings of the said defendant are contrary to equity and good conscience and tend to the manifest injury of your orators in the premises. In consideration whereof, and forasmuch as your orators can only have adequate relief in this honorable court, where matters and things of this sort are made cognizable by the statute; to the end, therefore, that said defendants may, if they can, show why your orators should not have the relief hereby prayed, and may, upon its corporate oaths and according to its best and utmost knowledge, remembrance, information, and belief, full, true, direct, and perfect answer make to the matters and things hereinbefore stated and charged, and that the said defendant may answer the premises, and that it may be decreed to account with and pay over to your orators the profits which it has realized, as well

as the damages suffered by your orators, from or by reason of said alleged infringement of said reissued letters patent since the date thereof; and may it please your honors, the premises considered, to grant unto your orators the writ of perpetual injunction, issuing out of and under the seal of this honorable court, or issued by one of your honors, according to the form of the statute in such
8 case made and provided, enjoining and restraining the said defendants, The Sullivan Machine Company, its clerks, attorneys, agents, servants, and workmen, and each and every of them, from manufacturing and selling, or causing to be sold or manufactured, any rock drills constructed substantially according to or containing and embodying the invention described in and secured by the reissued letters patent No. 3690, so granted to Asahel J. Severance, as the assignee, by mesne assignment, of Rudolphe Leschot; and also that a writ of preliminary or provisional injunction may issue so restraining the said defendant pending this suit.

And that your orators may have such other and further relief as the nature of the case may require and to your honors shall seem meet, may it please your honors to grant unto your orators not only the writs of injunction conformable to the prayer of this bill, but also the writ of subpœna directed to the said defendant, The Sullivan Machine Company, and commanding it, on a day certain therein to be named, to be and appear in this honorable court, then and there to answer the premises and to stand to, perform, and abide such further order, direction, and decree as may be made against it.

AMERICAN DIAMOND DRILL CO.,
By CHARLES H. TOMPKINS, *President.*

KELLER & BLAKE, *Of Counsel.*

UNITED STATES OF AMERICA, }
Southern District of New York, } *ss:*

Charles H. Tompkins, being duly sworn, deposes and says that he is the president of the American Diamond Drill Company, complainant, in the foregoing bill named; that he has read the same and knows the contents thereof, and that the same is true of his own knowledge, except as to those matters therein stated on infor-
9 mation and belief, and as to those matters he verily believes it to be true.

CHAS. H. TOMPKINS.

Sworn to before me this 10th day of September, A. D. 1872.

J. B. ANTHON,
Notary Public, N. Y. Co.

(Endorsed:) U. S. circuit court, south. dist. of N. Y. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Bill. Keller & Blake, compl't's sol'rs. Filed Sept. 25, 1872.

Answer.

Circuit Court of the United States for the Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

The answer of the Sullivan Machine Company, defendants, to the bill of complaint of the American Diamond Drill Company, complainants.

To the honorable judges of said court:

These defendants, reserving to themselves all right of exception to the said bill of complaint, for answer thereto say—

First. That they admit that the American Diamond Drill Company, complainants, are a corporation created and doing business under and by virtue of the laws of the State of New York, and have their principal place of business in the city of New York, and that the defendants are a corporation organized and doing business under and by virtue of the laws of the State of New Hampshire, and have their principal place of business at the town of Claremont, in said State.

Second. That they deny that before the 14th day of July, 1863, or at any other time, one Rudolph Leschot, a citizen of the Republic of Geneva, was the original or first inventor of the new and useful improved rock drill alleged in said bill, or that said rock drill had not been known or used by others before said alleged invention by said Leschot, or that said Leschot made due application to the Commissioner of Patents of the United States for letters patent for said alleged invention, or that said Leschot complied with all the provisions of the statute in such case made and provided, as alleged in said bill; but these defendants say that they have been informed and believe it to be true that the said Leschot applied for and obtained letters patent of the United States of America for an alleged invention relating to rock drills, dated the 14th day of July, A. D. 1863, signed, countersigned, and sealed, as alleged, but these defendants, for greater certainty, ask leave to refer to said letters patent and to the papers upon which said letters were granted when the same shall be produced.

Third. That they know not and have not been informed save by the complainants' bill whether or not, after the date last named and before the 16th day of February, A. D. 1869, or at any other time, one Asahel J. Severance had become, by mesne assignments, the owner and holder of the alleged letters patent granted and issued to the said Leschot, or whether or not the said Severance, without any fraudulent or deceptive intention, surrendered the said letters patent to the Commissioner of Patents, or whether or not said Severance, fully and in all respects, complied with all the requirements of the law, as alleged in said bill of complaint, or whether or not, after due

proceedings were had as alleged, the said Commissioner of Patents canceled said original letters patent, and on the 16th day of February, A. D. 1869, caused new and amended letters patent to be issued in lieu thereof, signed, countersigned, and sealed, as alleged in said bill, all in due form of and according to law, or whether or
11 not thereby there was granted and secured unto the said Asahel J. Severance, as such assignee or otherwise, his heirs, administrators, or assigns, for the unexpired term of seventeen years from the 14th day of July, A. D. 1863, or for any other term, the full and exclusive right and liberty of making, using, and vending to others to be used the said or any such pretended invention.

Fourth. They do not know and have not been informed, save by said bill of complaint, whether or not, after said last-named date and before the 26th day of October, 1869, or at any other time, the said Asahel J. Severance, without any fraudulent or deceptive intention, surrendered the said letters patent, or whether or not the said Asahel J. Severance complied with all the requirements of the law in that behalf, as alleged in said bill, or whether or not, after due proceedings were had, the said Commissioner of Patents canceled said reissued letters patent and caused other new and amended letters patents to be granted in lieu thereof, which were signed, countersigned, and sealed, as alleged in said bill of complaint, or whether or not, by any such alleged letters patent, the full and exclusive right and liberty of making, using, and vending to others to be used the said alleged invention was granted or secured to the said Asahel J. Severance, assignee, as alleged, or to his heirs, administrators, or assigns, for the term of seventeen years from the 14th day of July, 1863, or for any other term.

Fifth. That they do not know and have not been informed, save by said bill of complaint, whether or not, after said last-named date and on the second day of June, 1871, or at any other time, the said Asahel J. Severance and one William T. Holt were the sole and exclusive owners and holders of the said letters patent so granted and reissued as alleged in said bill, or whether or not, by their respective deeds of assignment, duly executed and bearing date June 2d, 1871, the said Severance and Holt assigned, sold, transferred, and set over to the complainants the said letters patent and the several reissues thereof for, in, and throughout the State of New York
12 and certain other places, as alleged in said bill of complaint, or whether or not, by virtue of the said two deeds of assignment or otherwise, the complainants became and are now the sole and exclusive owners and holders of the said letters patent and of all rights and privileges thereby granted or secured or intended so to be for, in, and throughout the State of New York, or whether or not the said Rudolphe Leschot was and is the original and first inventor of the said alleged invention, or whether or not said alleged invention was of great or any utility or value; and the defendants say it is not true, as alleged in said bill, that the complainants will realize or receive large or any gains or profits from said alleged invention and letters patent if infringements by the defendants or any one else shall be prevented; and it is not true that the defend-

ants, wrongfully intending to injure the complainants or otherwise, or to deprive them of any gains, profits, or advantage which they might or otherwise would have derived from said alleged invention, have, at the city of New York or in the State of New York or elsewhere, either with or without the consent or allowance or against the will of the complainants, manufactured or sold or are now still manufacturing or selling at said city of New York or elsewhere large or any quantities of rock drills constructed in any respect according to or containing or embodying the said alleged invention or any part thereof, or that the complainants have any reason to believe the said allegations of their bill, or that the defendants have caused the complainants any damage whatever, as alleged in said bill of complaint.

Sixth. The defendants, upon information and belief, aver that the alleged invention of the said Leschot was, as described in his original specification, simply a boring tool, composed of a series of diamond edges attached to an annular or tubular stock or crown of steel or other metal, to which a rotary and direct forward motion was given, and which was thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel which could be easily
detached by the subsequent operation of a gad or wedge, the
13 quantity of matter required to be removed by such boring tool
being very small in proportion to the cavity which was formed after the withdrawal of the kernel or core; that more than eight years prior to said original letters patent of the said Leschot, one Hermann, of Paris, France, obtained a patent of invention from the French Government, under date March 31st, 1885, published soon thereafter in the printed publication known as "Le Technologiste," wherein said Hermann described a boring tool, armed with diamonds, similar in all respects to that described by said Leschot in said specification, and that by reason thereof the said letters patent set out in the bill of complaint and the several reissues thereof alleged in said bill were void and of no effect.

Seventh. The defendants, upon information and belief, also aver that the several specifications upon which the reissued patents alleged in the bill of complaint were obtained did not conform to the rules and regulations of the Patent Office, nor to the statutes of the United States in such case made and provided, in that said application was not made upon the oath of the inventor, nor with his knowledge or assent, and in that new and independent matter was inserted therein with fraudulent or deceptive intention, and that by reason thereof the said letters patent have become void and of no effect.

Eighth. The defendants further aver that they are, and for several years last past have been, engaged in manufacturing, vending, and selling, also in using, rock-drilling machines; that said machines have, each and all, been furnished with drill heads or bits constructed under letters patent issued from the United States Patent Office, dated May 23d, 1865, and numbered 47812, and reissued September 29th, 1868, by the number 3142; that said drill head or bit is not an annular bit, nor does it leave, in boring, a central core or kernel;

but it consists of a drill head or bit so armed with diamonds that in the operation of boring the entire rock in the course of the drill head is disintegrated and removed.

14 That said drill bit has nothing in or about it which was claimed by the said Leschot as his invention, but for many uses the said drill head or bit has decided advantages over the boring tool alleged in said bill of complaint to be the invention of the said Leschot, all of which was well understood and known by the said Severance and the said Severance and Holt long before the applications for reissues alleged in the bill of complaint were made, and that in and by the said reissues there has been, on the part of the said assignees of the said Leschot, the attempt to modify and enlarge the alleged invention and claim of the said Leschot, so as to include an entirely different and distinct boring tool from that described by said Leschot, and, in substance, the same boring tool patented as aforesaid by the said Grier and Boyd, all of which was in violation of the law and a fraud upon the public.

Ninth. The defendants, for further answer, aver, upon information and belief, that the said rock-drill machines referred to, manufactured by them, were first applied and used in the years 1867 and 1868, in a marble quarry in Vermont, in which the said Severance was then interested as a stockholder and director, and with his personal knowledge; that there, with his (said Severance's) approval and assent, the attempt was made to use the drill head or boring tool claimed to be the invention of the said Leschot, but the same could not be there used to advantage, and it was abandoned with the knowledge of said Severance, and then and there the said drill head now used by the defendants was successfully introduced in said quarry, and has been in use there upon various machines until the present time; that the said Severance did not then claim or pretend that said last-named drill head was an infringement of the Leschot patent; on the contrary, he negotiated with the assignors of defendants upon the basis that the claims represented by them were distinct from and independent of the claims on his part, as assignee of the said Leschot, and that said Severance and Holt continued such negotiations upon the same basis until subsequent to the first reissue set out in the bill of complaint when such negotiations ceased.

15 Tenth. And the defendants deny that the plaintiffs are entitled to any further or other discovery from the defendants than is in this answer before given, or to any injunction, account, decree, or relief, as prayed for or sought in or by the said bill; and if there is any other matter, cause, or thing in the complainants' bill of complaint contained material or necessary for these defendants to make answer unto, and not herein and hereby well and sufficiently answered, confessed, traversed, and avoided or denied, the same is not true to the knowledge or belief of the defendants; all which matter and things the defendants are ready and willing to aver, maintain, and prove as this honorable court shall direct,

and humbly pray to be hence dismissed, with their reasonable costs and charges in this behalf most wrongfully sustained.

SULLIVAN MACHINE CO.,
JAMES P. UPHAM, *Pres.*

BRAINARD & RICE,
Solicitors for Def'ts.
E. T. RICE, *Of Counsel.*

UNITED STATES OF AMERICA.

DISTRICT OF NEW HAMPSHIRE, } *ss:*
County of Sullivan, }

James P. Upham, being duly sworn, deposes and says that he is president of the Sullivan Machine Company, defendants named in the foregoing answer; that he has read said answer and knows the contents thereof, and that the same is true of his own knowledge, except as to those matters therein stated on information and belief, and as to those matters he verily believes it to be true.

JAMES P. UPHAM.

Sworn before me this 18th day of December, A. D. 1872.

[L. S.] OTIS F. R. WAITE,
Notary Public.

(Endorsed:) U. S. circuit court, southern district of New York. In equity. The American Diamond Drill Co. *vs.* The Sullivan Machine Co. Defendants' answer. Brainard & Rice, sol'rs for def'ts, 41 Wall St., N. Y. Filed Dec. 20, '72.

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16 Circuit Court of the United States for the Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

The replication of The American Diamond Drill Company, complainants, to the answer of The Sullivan Machine Company, defendants.

These repliants, saving and reserving unto themselves all and all manner of advantage of exception to the manifold insufficiencies of the said answer, for replication thereunto, say that they will aver and prove their said bill to be true, certain, and sufficient in the law to be answered unto, and that the said answer of the defendants is uncertain, untrue, and insufficient to be replied unto by these repliants, without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the law to be replied unto, confessed and avoided, traversed or denied, is true; all which matters and things these repliants are and will be ready to aver and prove as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

KELLER & BLAKE,
Complainants' Solicitors.

(Endorsed:) U. S. circuit court, south. dist. of N. Y. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Replication. Filed Feb'y 1, '73.

17 Circuit Court of the United States, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

Proofs for final hearing in the above-entitled cause taken on the part of the complainants before Edward G. Thompson, one of the standing examiners of this court, under and pursuant to the 67th rule in equity, as amended.

NEW YORK, *March 25th*, 1873—11 a. m.

Present: Chas. F. Blake, Esq., of counsel for complainant; E. T. Rice, Esq., of counsel for defendant.

Counsel for complainants offers in evidence certified copy of reissued letters patent of the United States, granted to Asahel J. Severance, of Middlebury, Vermont, assignee, by mesne assignment, of Rodolphe Leschot, No. 3690, dated October 26th, 1869, marked Complainants' Exhibit No. 1, E. G. T., Ex'r; also offers in evidence Exhibit No. 2.

Counsel for defendant admits that the defendants have made, used, and sold boring heads united with boring bar, as indicated by Exhibit No. 2, in Vermont and in the southern district of New York.

Counsel for defendants admits that the defendants in using said boring bit also forced a stream of water through the boring bar.

EDWARD S. RENWICK, a witness produced on the part of 18 the complainant, being duly sworn, in answer to interrogatories propounded by Mr. BLAKE, deposes and says:

Q 1. What is your name, age, residence, and profession?

A. Edward S. Renwick; I am 50 years of age; I reside at Millburn, New Jersey, my place of business being the city of New York; I am by profession a civil and mechanical engineer, but am engaged principally in acting as scientific expert in the trials of patent causes and in soliciting patents.

Q 2. Have you read and do you understand the reissued letters patent, Complainants' Exhibit No. 1, and the invention therein described?

A. I have read a Patent-Office copy of Complainants' Exhibit No. 1 and believe that I understand the invention therein described.

Q. 3. Please look at Complainants' Exhibit No. 2 and compare it with the devices described in Complainants' Exhibit No. 1, and please state whether or not they are substantially like or wherein, if at all, they are substantially different, giving your reasons for any opinion you may express.

A. Upon comparing Complainants' Exhibit No. 2 with the devices described in Complainants' Exhibit No. 1 I find that the former contains, in substance, the following devices which are described in the latter, viz:

1st. A boring head adapted to be continuously revolved and progressed or moved forward.

2d. Diamond points which project from the face of said boring head.

3d. Diamond points which project beyond the periphery or circumference of said boring head.

4th. A tubular boring bar or drill rod adapted to connecting the boring head with the mechanism for causing it to revolve and progress or move forward, and also adapted, by reason of its being tubular, to permitting of the injection of a stream of water to the boring head and through the orifice thereof for the purpose of washing out and carrying away the detritus which is produced by the operation of the revolving and progressing diamond points upon the stone.

19 I have made this statement with the understanding that the tubular screwed piece which is connected with the boring head of Exhibit No. 2 is a short section of the boring bar or drill rod, which, in the practical operation of the machine, extends sufficiently from the boring head to connect it with the mechanism for causing it to revolve and progress or move forward, and with a hose or other means for supplying a stream of water.

Q. 4. Please state whether you find in Complainants' Exhibit No. 2, in combination, the devices recited in the first, second, and third claims, respectively, of Complainants' Exhibit No. 1, and combined in the manner recited in those claims, and give your reasons for the opinion you may express.

A. I find that said Exhibit No. 2 contains substantially the combination of devices recited, respectively, in the first, second, and third claims of the patent, Complainants' Exhibit No. 1. My reasons for stating that Complainants' Exhibit No. 2 contains, in substance, the combination of devices recited in the first claim of said patent are as follows: As I understand the said patent, the said combination is composed of the following members, viz:

1st. A boring head, which is adapted to being revolved and progressed and which is tubular or hollow, so that water can be forced through it and be caused to pass out at its face.

2d. Diamond points, which are secured to the said boring head and project beyond its surface.

3d. A tubular boring bar, adapted to connect the said boring head with mechanism for causing it to revolve and progress, and with a hose or other means of applying a stream of water to it.

The said three members are also so combined that the diamond points are carried by the boring head; that the boring head is secured to the tubular boring bar, and that the tubular boring bar transmits the revolving and progressing movements to the boring head and supplies it with water, which, issuing from the orifice of the head in the vicinity of the diamond points, washes away the detritus.

20 Now, in Exhibit No. 2 I find substantially the same members combined substantially in the same manner. The boring head in said exhibit is the cylindrical blunt-pointed head to which the diamonds are secured. The diamond points of said exhibit are the diamond points secured to the said head and projecting from its face and from its periphery. The tubular boring bar of said exhibit is the tubular screwed section of a boring bar which has the boring head secured to it and has its tubular bore connected with the cavity of the boring head, so as to supply the latter with water, which is permitted to issue through two orifices in the vicinity of the diamond points.

In making this statement I have taken into consideration the facts that the particular form of boring head represented in the drawings of the patent is annular and is fitted with diamond points which project inwards from its inner periphery, as well as with diamond points which project from its face or forward and with diamond points which project from its exterior periphery, whereas in Exhibit No. 2 the boring head has not this peculiar annular form, and has no diamonds projecting inward from an interior periphery.

But I do not regard this difference as material when considering the combination recited in the first claim of the patent, because, as I understand the language of the patent, that combination is not restricted to every one of the minor peculiarities of the boring head represented in the drawings, but requires only that the boring head shall be tubular or hollow, with an orifice, so that water can be forced through it when it is combined with a tubular boring bar, and that it shall be studded with diamond points, which project from its surface, so as to operate upon the rock, against which they are forced and turned by the action of the boring head and the tubular boring bar.

My reasons for stating that the Exhibit No. 2 contains, in substance, the combination recited in the second claim of the said patent are as follows: The said combination, as I understand the patent, is composed of two members, which are—

21 1st. A row or set of cutting edges composed of diamond points which project beyond the circumference of the boring head, so that they will, by their action, produce a hole which is larger in diameter than the said boring head.

2d. The boring head to which the said projecting diamond points are secured, which boring head is adapted to being revolved.

Now, I find in Exhibit No. 2 diamond points corresponding with those required by the said second claim, viz., those two which project from the periphery of the boring head; and, from appearance, I think that the third diamond, near the periphery of the boring head, projected therefrom when first secured thereto, but has been accidentally broken. The boring head in the said exhibit, corresponding with the boring head recited in the second claim, is the cylindrical head to which the diamonds are secured and which is adapted to being revolved for the purpose of moving the diamonds in contact with the rock.

My reasons for stating that the said exhibit contains, in substance, the combination of devices recited in the third claim of the said patent are as follows: The said combination, as I understand the said patent, is composed of the following members, viz:

1st. The boring head, adapted to being revolved and progressed or moved forward.

2d. Cutting points of diamonds projecting beyond the periphery of the said boring head, so that they will cut a hole of larger diameter than the boring head.

3d. A hollow drill rod, or tubular boring bar, having the peculiarities of the boring bar recited in the first claim, as previously stated by me.

Now, in Exhibit No. 2 I find three members corresponding with those above mentioned and combined in the same way, the boring head of that exhibit, being the cylindrical head to which the diamonds are secured; the cutting points of the diamonds, being the cutting points of those diamonds which are set into the said head near its periphery so that their points project beyond its
22 periphery, and the hollow drill rod of the said exhibit, being the section of the screwed rod which is secured to the said boring head for the purpose of transmitting the revolving and progressing motions to the head and cutting points and of conveying to the said head and points the supply of water.

In making the above statements in reference to the second and third claims, I have taken into consideration the same facts in reference to the peculiar forms of the boring head represented in the drawings of the patent and of the boring head of the exhibit that I have mentioned when speaking of the combination recited in the first claim, but I do not consider the differences between the two forms material in reference to the combinations recited in the said two claims, because, as I understand the patent, the combinations recited in those claims are not restricted to a boring head of annular form, or to the use of diamond points projecting inward from the inner periphery of an annular head, and because an annular head is unnecessary for the purpose of holding and revolving diamond points which are required to project only, as recited in the second and third claims, beyond the circumference or periphery of the head.

Q. 5. How do the diamonds in the head operate to drill the hole in the stone?

A. As they are pressed against it and moved they scrape off the surface of the stone, and as they are moved in a circle they produce a round hole by such scraping.

Examination adjourned till March 26, 1873, at 11 a. m.

NEW YORK, *March* 26, 1873—11 a. m.

Present: Counsel for both parties and—

The witness, E. S. RENWICK, who, being further examined by Mr. BLAKE, deposes and says as follows:

Q. 6. What is the purpose of the screw on the surface of the boring rod, Exhibit 2?

23 A. The screw forms part of the means, by means of which
the boring rod, head, and diamonds are caused to progress or move into the stone.

Q. 7. In your judgment would it be practicable to operate the boring head without a stream of water?

A. In my judgment it would not.

And, being cross-examined by Mr. RICE, deposes and says as follows:

X Q. 8. When and by whom were you first retained in this matter?

A. The exact date when I was first employed I cannot give. It was some days previous to October 18, 1872, on which date my ordinary retaining fee was paid me. I was employed in the matter by Messrs. Keller & Blake.

X Q. 9. In what capacity were you employed and for what purpose?

A. I was employed in the capacity of scientific expert for the purpose, I suppose, of rendering such services as experts are called upon to render in patent causes.

X Q. 10. Was anything specified, in writing or otherwise, at that time or about that time as to what you were to do in this particular case?

A. Nothing other than the statement in my receipt for the retaining fee to the effect that I was to act as expert in this case.

X Q. 11. Now, as such expert, please state what you have done.

A. I have examined carefully the copy of the reissued patent, Exhibit No. 1, and also a copy of the original patent, No. 39235, dated July 14, 1863. I have also examined what purported to be a copy of the publication of a French patent to Hermann, and a translation of the same. I have also had several consultations with Mr. Blake, the counsel for complainants, on the subject of the patents and the infringement, and have given my testimony herein.

X Q. 12. When did you first see the copy Exhibit No. 1, about?

A. I can't recollect, but probably in December last. The
24 first charge that I have for services rendered in the case is
dated December 20, 1872, and I have a recollection of having had some conversation with Mr. Blake or Mr. Keller before that date, and my impression is that I saw a copy of the reissued patent Exhibit No. 1 at the time of such conversation.

X Q. 13. What, if any, other paper did you see at that time in this matter?

A. At the time of such first conversation I do not recollect what papers I saw.

X Q. 14. How thorough an examination did you then make of Exhibit No. 1 or the copy?

A. I have no distinct recollection of what occurred at the time of such first conversation. I have an impression that I read over the copy of the patent, Exhibit No. 1, and that I took it with me to read over and examine more carefully in my own office, but it is possible that it may have been sent to my office after such conversation and before December 20, 1872.

X Q. 15. What, if any, other paper did you have before you relating to this drill during such examination?

A. My impression is that I had at the same time a copy of the original patent, No. 39235, and a copy of the publication of the French Hermann patent.

X Q. 16. How long did you retain those papers for such examination?

A. I have no means of estimating how long they were in my hands, but I had them December 20, when, my recollection is, they were delivered over to Mr. Blake. It is possible that I may have had them up to January 6, when I had a second consultation with Mr. Blake on the subject.

X Q. 17. Have you had them since January 6; if so, when and for how long?

A. I cannot recollect whether I have or have not. My impression is that I did not have them after January 6 until yesterday, about an hour before the commencement of my examination in this case, when I read them over again carefully to refresh my memory as to their contents.

X Q. 18. Can you identify those papers?

25 A. I can identify one of them by pencil memoranda which I made upon it. I have no means of absolutely identifying the others. They were left in the office of Messrs. Keller & Blake.

Mr. Rice, counsel for defendants, calls upon the counsel for complainants to produce the papers above referred to.

Counsel for complainants produces the papers called for by counsel for defendants. The copy of the reissue seen by the witness is the same as Exhibit No. 1.

Mr. Rice, counsel for defendants, puts in evidence a copy of the letters patent granted to Rodolphe Leschot, dated July 14, 1863, No. 39235, for "Tool for boring rock," which is marked Defendants' Exhibit A, of this date; also French copy of Hermann specification and certificate of addition, marked Defendants' Exhibit B, of this date; also a translation of Exhibit B, marked Defendants' Exhibit C, of this date; also copies of two drawings referred to in Exhibit B, which are marked Exhibit D, of this date.

X Q. 19. The papers referred to and produced are all the papers that you have examined in this matter, are they?

A. I believe they are.

X Q. 20. Have you at any time, before this matter, been employed as an expert in respect to drills of any kind?

A. I was employed as an expert in a suit involving the construction of what are commonly called machinists' twist drills.

X Q. 21. Please describe such drill in respect to its bit or cutting part.

A. The cutting part of the bit consists of a cylinder having two
helicate grooves formed in it and extended to its point, where
26 two radial cutting edges are produced by the cutting away of
the metal by the formation of the grooves; such drills vary
in size from that of a needle upward.

X Q. 22. How, as to those cutting edges, do they project at all from the cylinder?

A. There is no circumferential projection of the cutting edges; the edges are part of the drill itself and are the most forward portions of the metal of which the drill is made.

X Q. 23. Does not the metal cylinder supporting the cutting edges recede a little from the cutting edges?

A. I have never noticed that the cylindrical part diminishes in diameter from the cutting edges toward the shank, although it is possible it may do so in drills of large size.

X Q. 24. Have you examined the model of Leschot machine at the Patent Office?

A. I have not.

X Q. 25. Have you, since retained in this matter, examined a Leschot machine or drill?

A. I have never examined any drill which I knew to be made by Leschot, or under his direction, and have never examined any drill made in all respects like the one represented in the drawings of the Leschot patent.

X Q. 26. Please state what you have examined, since retained in this matter, pertaining to diamond drills.

A. The only embodiment of a diamond drill that I have examined since I was retained in this matter is Complainants' Exhibit No. 2, which was first seen by me yesterday or the day before.

X Q. 27. Have you seen, at any time, a copy of a specification of the first reissue of the Leschot patent?

A. I think I have, but I never examined it with care; my impression is I saw the title of the copy and laid it aside without reading it.

X Q. 28. Will you please look at the drawing attached to Defendants' Exhibit A, figure 1, and state what that represents?

A. It represents an end or face view of the boring head and
27 diamond-cutting points, having the annular form described
in the written portion of the patent, the whole being called
in the original a "boring tool."

X Q. 29. Is any other form of boring bit or tool shown in the drawing?

A. No other form is shown in the drawing.

X Q. 30. Is the drawing attached to Exhibit A the same, substantially, as that attached to Exhibit No. 1?

A. It is.

X Q. 31. Now, in connection with looking at figure 1, attached to the drawing, Exhibit A, please look at Exhibit No. 2, the diamond-studded end, and state what difference appears between the two, if any.

A. I understand that the question confines me to the drawing of Exhibit A, but with the understanding that the devices noted therein by the letters a, a^1, a^2 are diamond points. The differences that appear to me are that the boring head represented in the drawings is of an annular form, with its orifice concentric with its exterior periphery, whereas the boring head of Exhibit No. 2 has the form of a tubular boss with two small apertures. The boring head represented in the said drawings has, in addition to diamond points which project forward and beyond its circumference, other diamond points, which project inward from its internal periphery, whereas no such inwardly projecting diamond points are found in Exhibit No. 2. The boring head of Exhibit No. 2 has diamond points upon the central portion of its boss, so that the boring head is adapted to reducing to powder the entire mass of stone which is removed to form the hole, whereas no such central diamond points are found in the boring head represented in the said drawings.

X Q. 32. You may state the form of holes that the bit like Exhibit 1 would bore.

A. They would bore cylindrical holes with a core left standing in the hole and within the boring head and tubular boring bar until they were withdrawn from the stone.

28 X Q. 33. Look again at figure No. 1, Exhibit A, and state whether a boring head armed with diamonds simply, as shown by the letters *a* —, without the other diamond points, could be made to bore; if so, to what extent.

A. If the head was made with only the diamond points represented by the letters *a a*, which points project only in a forward direction, the tool might be used to bore to some extent, but it would not, in my opinion, be of material practical value for boring, as the metal of the head would be ground off by contact with the stone and the friction would be great. There would also be no space for the escape of water at the periphery of the boring head. The tool might, however, be used for cutting shallow grooves or for surfacing.

X Q. 34. Now, suppose the head was armed by diamond points only such as are represented by a^1 a^1 in the drawing, without the other diamond points, could the tool so armed be used as a boring tool; if so, to what extent?

A. If the boring head represented in the drawing were armed only with the diamond points represented by a^1 a^1 it would not, in my opinion, be of practical value in boring.

X Q. 35. How would it be in case the annular boring head were armed only with diamonds, as shown in a^2 a^2?

A. If the same head were armed only with diamond points projecting inward, as those indicated by the letters a^2 —, it would not, in my opinion, be of practical value for boring.

X Q. 36. To make, then, a boring tool like that shown in figure 1 effectual diamonds as shown at *a*, a^1, and a^2 are all essential, are they not?

A. If the boring head is to be of annular form, as represented in the drawing, it must, in order to be practically valuable, have diamond points projecting like the points of those denoted by the letters *a*, a^1, a^2, forward, outward, and inward; but it does not follow that it must have six diamonds in order to have such diamond points, as the same diamond might project simultaneously in those three directions, or in two of those directions, if it were large enough and properly set.

Adjourned to Thursday, March 27, 1873, at 11 a. m.

29 NEW YORK, *March* 27, 1873—11 a. m.

Met pursuant to adjournment.

Present: Counsel for both parties.

And the witness, E. S. RENWICK, being further cross-examined, says:

X Q. 37. Will you please look at the copy specification forming part of Defendants' Exhibit "A," at the bottom of the first page of the specification, and state what the invention is confined to as described in that paragraph?

A. The invention, as set forth in that paragraph, is confined to the combination of a series of diamond edges with an annular stock or boring head in such manner as to enable an annular groove or hole to be formed in the stone by the rotary and progressive motions of the boring head and to leave a core within that annular groove.

X Q. 38. Will you state what you understand by "annular?"

A. By the term "annular," as generally used, I understand a ring form, or the form of a hollow cylinder, and unless the term be accompanied with language which renders the meaning explicit it generally is used to convey the idea that the inner and outer circumferences of the ring or hollow cylinder are concentric.

X Q. 39. What do you understand, then, by the expression "an annular groove or hole?"

A. I used the language to express the idea that a ring-formed cavity was produced, whose outer and inner walls were concentric with each other, the inner walls being formed by the exterior surface of the solid core and the outer wall being formed by the cylindrical surface of the stone into which the boring tool has been advanced. Of course, after the boring tool has been withdrawn the core of stone may be broken out and removed, leaving a cylindrical hole without a core.

X Q. 40. And the advantage of that is what, as set forth in that paragraph?

A. The advantage, as set forth in that paragraph, is that
30 the boring tool may be operated with a small amount of
power, because the amount of matter that is removed by bor-

ing is small in proportion to the size of the cavity which is obtained after the removal of the core.

X Q. 41. Is any other than an annular crown or boring head described in that specification—Exhibit A?

A. No other kind of boring head than one which is annular is described in that specification.

X Q. 42. Have you examined any printed works or publications relating to the use of diamonds for the purpose of drilling or boring; and, if yea, what?

A. I have read accounts in books of the use of diamond-pointed drills for drilling glass and china, but I cannot recollect what the books were, nor when I read the accounts. My reading of them had no connection with any controversy at the time which would tend to fix the dates or the names of the books in my memory. That is the extent of my reading on the subject of the use of diamond studded or pointed tools for the purpose of drilling or boring, with the exception of the patents and descriptions which I have already spoken of in connection with this case.

X Q. 43. Can you state generally whether such reading was within ten or twenty years?

A. Such reading was certainly within ten years, and probably within five years, of the present date.

And being re-examined by Mr. BLAKE:

Re-D. Q. 44. Compare the combinations recited in the claims of the last reissue of the Severance patent with the specifications of the original patent, and state whether or not all said combinations are found in the original patent.

A. Upon making the comparison I find that every member of the combinations recited in the claims of the reissue patent, Exhibit No. 1, is described in the copy of the original patent, Defendants' "Exhibit A," and that the said members are combined in the mechanism described in said Exhibit A in the same manner as they are recited to be in the claims of the said reissue, Exhibit No. 1.

And being further cross-examined by Mr. RICE:

31 Re-X Q. 45. Are they described in the copy specification forming part of Exhibit A otherwise than in connection with an annular crown or boring tool?

A. As I have already stated previously, there is no other description of a boring tool in "Exhibit A" than of one that is annular.

E. S. RENWICK.

Subscribed and sworn to this 27th day of March, 1873.

E. G. THOMPSON, *Examiner*.

Examination adjourned, by consent, to new notice.

NEW YORK, *August* 1, 1873—1 p. m.

Met pursuant to notice.

Present: Mr. Blake, of counsel for complainant, and Mr. Rice, of counsel for defendant.

Counsel for complainant offers in evidence certified office copy from the records of the Patent Office of the United States of an assignment from A. J. Severance to the New England Diamond Drill Co., marked Complainant's Exhibit No. 3, E. G. T., Ex'r.

Also certified office copy from the records of the United States Patent Office of an assignment from A. J. Severance to William T. Holt, marked Complainant's Exhibit No. 4, E. G. T., Ex'r.

Also certified office copy from the records of the United States Patent Office of an assignment from the New England Annular Diamond Drill Co. to William T. Holt, marked Complainant's Exhibit No. 5, E. G. T., Ex'r.

Also certified office copy from the records of the United States Patent Office of an assignment from the stockholders of the New England Annular Diamond Drill Co. to William T. Holt, marked Complainant's Exhibit No. 6, E. G. T., Ex'r.

32 Also certified office copy from the records of the United States Patent Office of an assignment from the New England Diamond Drill Co. to William T. Holt, marked Complainant's Exhibit No. 7, E. G. T., Ex'r.

Also certified office copy from the records of the United States Patent Office of an assignment from William T. Holt to the American Diamond Drill Co., marked Complainant's Exhibit No. 8, E. G. T., Ex'r.

Also certified office copy from the records of the United States Patent Office of an assignment from A. J. Severance to the American Diamond Drill Co., marked Complainant's Exhibit No. 9, E. G. T., Ex'r.

Time for closing proofs is extended, by consent of counsel for both parties, till October 1st, 1873.

Examination adjourned, by consent, to new notice.

E. G. THOMPSON, *Examiner.*

NEW YORK, WEDNESDAY, *October* 29, 1873.

Present: Counsel as before.

HENRY B. RENWICK, a witness on behalf of the complainant, being duly sworn, deposes and says:

Q. 1. What is your name, age, residence, and profession?

A. Henry B. Renwick; I am fifty-six years of age; reside in the city of New York; am a civil and mechanical engineer, and am frequently examined as expert in the circuit court of the United States in various circuits in suits in which patents are in question.

Q. 2. Have you read and do you understand the reissued letters patent, Complainant's Exhibit No. 1, and the invention therein described?

A. I have frequently examined the patent named in the question, and believe I understand the invention specified and described therein.

33 Q. 3. Please look at complainant's letters patent and compare the devices described in it and named in the third claim

thereof with Complainant's Exhibit 2, and state whether or not they are substantially alike, giving your reasons for the opinion you may express.

A. I find in Exhibit No. 2 a boring head, having a cutting point projecting beyond the periphery thereof. This point is a diamond. The boring head is hollow and has two holes extending from the cavity in it to the outside of the boring head. I understand that when in use this boring head is provided with a hollow central drill rod, called in the patent also a tubular boring rod, which is sufficiently long to be grasped by machinery which causes it to rotate and progress, and that this tubular boring bar is attached to the boring head. There is such a boring bar attached to the boring head in the Exhibit No. 2, but it is a very short one and could not be practically used in any boring machine that I have seen. I understand, further, that when the boring head making part of Exhibit No. 2 is used with such a tubular boring bar, as I have understood it has been used with, that a revolving and progressive motion is imparted to the bar, and consequently to the boring head, which is attached to it, and also that a current of water is forced through the tubular boring bar or drill rod and through the holes in the boring head, and escapes upwards or out of the hole that is being drilled between the walls of that hole and the outer periphery of the boring head and boring bar, a space existing between this outer periphery of the boring head and boring bar and the walls of the hole, owing to the fact that one or more of the diamond points project beyond the periphery of the boring head. The object of the devices referred to in combination in the third claim of the patent is, as I understand it, to bore a hole in stone or rock by the revolving and progressing motion of the boring head and its points and to wash out the detritus or borings by means of a stream of water, passed down through the tubular boring bar and the boring head and escaping as before described. The boring head specially described in
34 the patent is one which would bore an annular hole, or, in other words, a hole enclosing a spindle or core of rock. The boring head shown in Exhibit No. 2 will not leave any core, but will bore out the whole of the rock within the circumference of the hole, but both the boring head described in the patent and that shown in the exhibit bore a hole by acting on the rock at the bottom of the hole and at the corner (if it may be so called) where the walls of the hole meet its bottom, and both bore a hole larger than the diameter of the boring head, and these I understand to be the only limitation to the construction and mode of operation of the boring head referred to in the third claim, except that it shall have a passage leading from its interior to its end, through which water may be passed. The boring head, Exhibit 2, has two such passages. The hollow central drill rod or tubular boring bar described in the patent and used in connection with the boring head, Exhibit No. 2, are both hollow, both connect with the opening or openings through the boring head, are both smaller in diameter than the hole which is being bored, and are both, when in use, caused to revolve and progress. I find, therefore, substantially the same boring rod and

boring head in the exhibit as are referred to in the third claim of the Plaintiff's Exhibit No. 1, and find that Complainant's Exhibit No. 2, made and capable of use as I have described, contains the invention referred to in that claim.

Q. 4. What is the operation of the diamond in boring into the rock?

A. It abrades from the rock small particles of rock, like sand or fine powder.

And, being cross-examined, says as follows:

X Q. 5. When did you first examine Complainant's Exhibit No. 1?

A. Some time before July 1st. I cannot tell when.

X Q. 6. At the time of such examination or at any subsequent examination of Exhibit No. 1 what else did you have before you besides that exhibit?

A. I cannot recollect all the papers that were sent to me
35 and that I examined. I did examine two copies of French patents; I think a copy of the defendant's patent in this case; also a copy of a former reissue of the complainant's patent; also a pamphlet describing the drilling machines made by the defendant; there was also a copy of my brother's testimony in this case, some parts of which I remember reading.

X Q. 7. Did you have before you at such examination a copy of the original issue of the Leschot specification?

A. I am not certain whether I had or had not; my impression is that I have at some time examined the Leschot patent, or a copy of it.

X Q. 8. In your answer to question 3 you confine your testimony to the third claim. Do you find that Exhibit No. 2 contains devices described in the other claims in that patent? If so, state in what respect.

A. It does not contain the devices which are specified in combination in the fourth claim; it does contain the invention specified in the second claim of the patent. Respecting the first claim, I was somewhat in doubt as to the construction of it at first, but after attentive reading and consideration of the patent, as a whole, I came to the conclusion that the boring head, which forms one of the elements of the first claim, was, in view of the language of that claim, a boring head which must be provided with points not only projecting from its periphery and from its end, but also into the water cavity in the hollow of the boring head, so as to act upon the outside of a core or spindle of rock. As the defendant's boring head, Exhibit No. 2, has not these points projecting into the hollow of the boring head, I came to the conclusion, according to my construction of the claim, that the Complainant's Exhibit No. 2, constructed and used as described, did not contain the invention specified in that first claim.

X Q. 9. Must not the cutting points or edges of any boring tool cut a hole of a little larger diameter than the diameter of the boring bar which supports the boring head?

A. The cutting or abrading points or diamonds described in the plaintiff's patent and found in the defendant's machine, which 36 are not cutting edges, as they do not cut a chip, must project beyond the periphery of the boring head, so as to cut a hole larger than the diameter of the boring head itself. In ordinary augers, which are used without boring bars, the hole bored is only the diameter of the auger. In some kinds of drills for drilling iron, which are used with a boring bar, the hole bored is larger than the diameter of the drill head, not because the drill head has projecting points or edges to act upon the walls of the holes, but because the drill has a longer edge upon one side of the centre than it has upon the other side. In the twist drills, which are now extensively used for drilling and boring, the hole drilled is of the same diameter as the tool and the cut is entirely upon the bottom of the hole. There are tools used by machinists, not for boring holes, but for enlarging holes already bored, and in which the edges do not act upon the bottom of the hole, which have cutting edges acting on the walls of the hole, which rebore the hole, so that it is larger in diameter than either the boring head or the boring bar. What is called a trephine saw is a saw cut upon the end of a hollow cylinder, so that it will cut an annular hole in a piece of bone or wood. I have never seen such a saw used for cutting over two inches in depth. I never saw or heard of one being used with a boring bar, but in such saws, which are old contrivances, there is, if my memory serves me right, a slight set given to the teeth so that the hole cut is slightly greater in diameter than the cylinder on the end of which the saw teeth are cut.

X Q. 10. When the diamonds are set in the drill bit or head, as in Exhibit No. 2, do they not form a substantial part of the drill head?

A. The patent of Severance draws a distinction between the boring head and the diamond points which are mounted in it, and I think that the distinction is a correct one, because you may have a head without the points and the points without the boring head. I do not think that the diamonds form a part of the boring head at any time, but when the boring head is ready for use or being used the diamonds are firmly attached to the head and move with it, and the points could not perform their duty unless they were so attached.

37 X Q. 11. Are not the diamonds set in the boring head the only cutting parts of the boring head or tool?

A. I do not think they are cutting parts of the boring head; they are the only parts which operate to cut.

X Q. 12. What progress in boring could be made with drill heads forming part of Exhibit No. 2 without the diamonds set in it?

A. If the diamonds were removed from the boring head the head would make no progress in boring.

X Q. 13. Will you please look at the copy specification forming part of Defendant's Exhibit A, at the top of page 2 of said specification, and state what the invention is confined to as described in that paragraph?

A. The invention described in that paragraph alone is a boring tool composed of a series of diamond edges attached to a tubular crown or stock in such manner that the tool as a whole will bore an annular hole. The position of the diamond in respect to the crown is not described in this paragraph, and I do not understand that the paragraph confines to anything. It is a general statement of the nature of an invention.

X Q. 14. What do you understand by the expression there used—"an annular groove or hole?"

A. I understand it defines a hole which could be filled by a hollow cylinder, or, in other words, a hole having a spindle or core of rock in the center of it.

X Q. 15. What, if any, advantages are set forth in that paragraph as attained by the use of a drill that will drill an annular hole?

A. That a hole of a given diameter may be bored by cutting out a ring only instead of cutting out all of the rock which originally filled the hole. There would be less wear of diamonds and less power employed in cutting such hole than would be the case if the whole surface at the bottom of the hole were cut over by the points.

X Q. 16. What, if any, other than an annular crown or boring head is described in specification, Exhibit A?

A. No other boring head is described.

X Q. 17. Will you please look at the plates forming part of Exhibit D, in connection with Exhibit C, and state what they are?

38 (Counsel for complainants objects to this question on the ground that it is not cross-examination relating to any of the matters contained in the witness' testimony-in-chief, and gives notice that he will insist that by any examination relating to said exhibit the defendant makes the witness his own witness *pro tanto* and will be bound by his answers.)

Defendant's counsel insists that it is proper cross-examination.

A. Defendant's Exhibit D purports to be copies of two drawings filed in an interference case before the Commissioner of Patents, with a copy of the certification thereof; and Defendant's Exhibit C purports to be a translation of a French specification filed upon the application of George Hermann for an American patent, without any certificate.

X Q. 18. Now, please state whether the drawing forming part of Exhibit D is a copy of a drawing which you examined in connection with the French patent to which you referred in your answer to the 6th cross-interrogatory.

(Same objection.)

A. I referred to a copy of a French patent. The drawing forming part of Exhibit D is not a copy from the drawing which I examined, but appears to be a tracing, imperfect in some parts, from the same original. I have thus far referred to plate 1 of Exhibit D. Plate 2 of Exhibit D is not a copy of the drawings of the copy of the French patent, but appears to be an imperfect tracing from another tracing from the same original.

X Q. 19. Will you please state in what respect figure No. 9 differs from the tracing which you examined?

(Same objection.)

A. It differs slightly in the configuration of the diamond
39 points, and also in the fact that these points are not shaded
so as to draw a distinction between them and a metallic cylinder in which they are set.

X Q. 20. Please state what figure 9 of Exhibit D represents.

(Same objection.)

A. It would be difficult to say what it represents by reference to the drawings alone. By reference to figure 9 of the French drawing and to a copy of the French patent in connection therewith I understand that figure 9 represents a cylindrical saw, by means of which a cylindrical block of stone like a portion of a column or pillar can be formed, this saw being composed of a metallic cylinder, having diamonds inserted in the end of it.

X Q. 21. How is that tool worked, as described in the patent?

(Same objection.)

A. The patent states that it is worked in a machine like an ordinary drilling machine; that it is mounted upon a boring bar in such manner that it will follow the revolving motion of the bar, but not be permanently attached to the bar, but be capable of sliding upon the bar in such manner that the saw may move downwards by its own weight, while the boring bar, which is a solid one, has no progressive or downward movement.

X Q. 22. What is the effect of that action of the tool?

(Same objection.)

A. The effect of that action of the saw would, if it would work at all (and I have great doubt whether it would work), would be to cut an annular hole, the cross-section of which was very narrow, of the same size as the outer diameter of the metal part of the saw, the saw moving forward by the force of gravity only, and if it cut a hole at all, being capable of cutting a hole only vertically downwards or nearly so, it is proposed to cut this hole clear through the block of stone, so as to utilize the core.

40 X Q. 23. By what immediately is the cutting accomplished?

(Same objection.)

A. By the diamond points in the end of the hollow cylinder of metal.

X Q. 24. Please state whether the drawing D does not indicate that the diamonds project a little outside of the outer circumference of the metallic cylinder and a little inside of the circumference of the metallic cylinder.

(Same objection.)

A. The drawing making part of Exhibit D shows in figure 9 one of the diamonds as projecting slightly inside of the metallic cylinder. There is no diamond shown as projecting outside of figure 9. In the figure represented on plate 2 of Exhibit D this fact, as far as it relates to the outside projection, is corroborated by the fact that the dotted lines showing the outside of the annular hole bored are continuations of the same line which represents the outer periphery of the saw.

X Q. 25. Please answer the same question in reference to the French drawings you have referred to.

(Same objection.)

A. In the French drawing, figure 9, there is apparently a slight inward projection into the hollow of the saw of one of the diamonds. Any assumption that it is a projection inwards is negatived by plate 2 of the French drawing, which is a much more perfect drawing than that attached to Exhibit D. In this plate of the French drawing the stone which is being acted upon and the lower part of the saw are shown in cross-section, and this cross-section shows that the annular hole bored in the stone is exactly filled by the metal of the saw, thus proving that there is no diamond projecting outwardly from the periphery or inwardly into the cavity of the saw.

Adjourned to Thursday, October 30, 1873, at 2 p. m.

41 New York, Thursday, *October* 30, 1873—2 p. m.

Adjourned to Saturday, Nov. 1, 1873, at 12 m.

New York, *Nov.* 1, 1873—12 m.

Present: Counsel for both parties.

And the witness, Henry B. Renwick, being further cross-examined by Mr. Rice, deposes and says:

X Q. 26. Will you please look at the French specification again, and state what different operations are claimed by that patent?

(Same objection.)

A. He claims the means which he has indicated of fixing the grains of black diamonds into the bars which are to support them by inserting them directly into these bars without the employment of tin or other analogous metal.

Second. In different arrangement of tools which I have figured in my drawing, and likewise in their application in turning, in slotting, in piercing, in sawing, and in general in the working of hard stones by the aid of machinists' tools, employed generally in working metals, but with steel tools.

X Q. 27. What is the date on the copy of the patent and of the drawings accompanying the same?

(Same objection.)

A. March 31st, 1855.

Redirect ([illegible]):

Re-D. Q. 28. What difficulties would you expect to find in working the tools shown in figure 9, and on plate 2, of the French drawings, to which you have been referred in your cross-examination?

A. The difficulties that I would expect to find arise from
42 three defects in the construction of the tool, as a whole, which is shown in figure 9, plate 1, and on plate 2.

These defects are:

First. That the diamonds are not so set as to cut a hole larger than the diameter of the cylinder of the metal in which they are secured.

Second. Because there are no means provided for imparting to the diamonds a progressive motion by machinery, their only progressive motion being that due to the weight of the tool when it is used vertically. If the tool were used horizontally, or at an inclination, it would probably not progress at all.

Third. Because I can find no construction, described or shown in the drawings, which would permit of the introduction of a current of water to wash out the detritus. Even if a stream of water were directed on the outside of the tool, I do not think it would effect the purpose.

I cannot tell positively, from the drawings, whether the top of the saw is closed up or not when applied, as shown on plate 2, but I should judge that it must be so closed by a round plate fitting inside of it—

1st. Because I find dotted lines on the drawings, which appear to indicate such plate; and

2d. Because I do not see how the saw could be correctly guided without such a plate.

If I am correct, there would be no way of introducing water into the interior of the saw, and even if water were introduced into the interior of the saw by a stream of water being directed on top of the tool (and there is no provision for any such use of the tool in the patent), then such stream would not be sufficient in washing out the detritus after the tool had progressed, if it would progress at all, down into the interior of the stone.

Re-D. Q. 29. What mischief would ensue from the fact that the diamonds are not set so as to cut a hole larger than the diameter of the cylinder of the metal in which they are secured?

A. Owing to imperfections in workmanship and the wabbling of the tool, the hole cut by it, even with the diamonds set as described, would probably be a little larger than the tool—that is to say,
43 the tool would not stick fast in the hole; but with the diamonds arranged as shown in the drawing (not projecting outwardly from the tool), the space between the walls of the tool and the hole bored would be, in my opinion, too small to permit the entrance and escape of a sufficient current of water to wash away the detritus, even if proper appliances for introducing such a current had been described in the patent.

The tool might possibly be used by sliding it up on the boring [illegible] attached [illegible] them, replacing the lost [illegible] but this could only be done when [illegible]

And, being further cross-examined by Mr. [illegible], says:

Re-X Q. 39. Will you look at Fig. 3, before referred to, and state what proportion of the upper face of the tool holding the diamonds is covered by the diamond as set, in width?

A. The drawing is a perspective one, and it is impossible to tell with any accuracy what proportion of the surface in width they do cover. As regards three of them, they may be of the same width, or a little less width, than the face of the tool. One of them—that on the left-hand side—as I said before, appears to cover the whole width of the face and to project a little inwardly into the hollow of the tool.

Re-X Q. 40. How far inwardly and outwardly would it be necessary for the diamonds to project in order to clear the way for the progress of the tool holding the diamonds?

A. If the tool were turned so as to bore a hole upwards, and proper machinery were applied to give it a progressive motion, the tool would probably not stick fast, even if the diamonds did not project at all.

If the tool is to be used in boring holes vertically downwards, or at an angle with the horizon, I do not think it would work satisfactorily unless the diamonds projected so far as to leave the [illegible] much larger than the tool that it would permit of the [illegible] escape of a stream of water.

How much space exactly would be needed for the [illegible] outside of the tool I cannot say. It would depend [illegible] shape of the tool-head in some measure, and upon [illegible] which the stream of water was injected by machinery [illegible] that purpose.

Re-X Q. 41. Have you ever tested or seen tested a tool like that described in Hermann's specification and drawings?

A. I have not.

HENRY B. RENWICK.

Subscribed and sworn to the 1st day of November, 1878.

E. G. THOMPSON, Examiner.

Examination adjourned, by consent, till November 3, 1878, at 1 p. m.

New York, November 3, 1878—1 p. m.

Examination adjourned till November 5, 1878, at 11 a. m.

New York, November 5, 1878—11 a. m.

Examination adjourned till November 14, 1878, at 11 a. m.

NEW YORK, *November* 14*th*, 1873—11 a. m.

Present: Counsel for both parties.

Counsel for complainant gives notice that he hereby closes his opening proofs, reserving the right to call a single witness to prove the value of the invention.

45 Counsel for defendant insists that complainants shall fully close their case before being compelled to go on with his testimony.

Examination adjourned till November 28, 1873, at 11 a. m.

NEW YORK, *December* 8, 1873—11 a. m.

Present: Counsel for both parties.

MILAN C. BULLOCK, a witness produced on the part of the complainant, being first duly sworn, in answer to interrogatories propounded by Mr. BLAKE, says:

Q. 1. What is your name, age, residence, and occupation?

A. Milan C. Bullock; I am 35 years of age; I reside in New York; I am a mechanic and superintendent.

Q. 2. State, if you please, what mechanical business you have been engaged in.

A. For the last three years I have been engaged in manufacturing and putting up diamond drills.

Q. 3. Have you had an opportunity of understanding the practice of quarrying stone, and, if so, what?

A. I have had considerable experience with stone-channelling machines, and have seen a great deal of quarrying done by hand and by diamond drills.

Q. 4. Please explain in detail how a block of marble is cut out of a quarry by hand.

A. By channelling on the four sides of a block, and by gadding underneath on one side and breaking the block up with plug and feather.

Q. 5. What do you mean by channelling?

A. I mean cutting a groove usually from an inch to one inch and a quarter in width to the required depth.

Q. 6. What do you mean by gadding?

A. I mean a series of holes parallel to each other under the block to be quarried.

Q. 7. When this has been done, how do you break the block up with a plug and feather?

46 A. By inserting the feathers in the holes underneath and driving the plugs or wedges between them. The term plug and feather is a quarrying term. The feathers are made of iron, semicircular and tapering, so as to fit the hole; they are in two pieces and when fitted in the hole leave a wedge-shaped space between them in which the plug or wedge is inserted, which plug is afterwards driven in by a hammer to split the block up from the bottom. By semicircular and tapering, I mean that the semicircu-

lar part fits the hole, while the tapering part makes the place for the wedge.

Q. 8. For what purpose in quarrying is a diamond drill used?

A. Diamond drills are used in quarrying for channel cutting and drilling gad holes for breaking or splitting blocks.

Q. 9. How extensively are diamond drills used for these purposes?

A. I could not tell how many machines are in use, but they are in very general and increasing use in Vermont, in the marble quarries.

Q. 10. Compare the amount of work done by diamond drills per day with hand work, stating how much a diamond drill does by day and how much hand labor it would require to do the same work.

A. I believe the average work of a man in channelling is from one and a half to two feet per day, in marble. I think the average work of diamond channelling machines is from sixty to eighty feet a day, in marble, to the best of my knowledge and belief.

Q. 11. What is the cost, as near as you know, of hand labor in channelling?

A. To the best of my recollection it is from about 75 cents to one dollar a foot.

Q. 12. How many men are needed to run a diamond channelling machine?

A. Two, I believe.

Q. 13. What are the wages of two men competent to run such a machine?

A. For a fireman or helper from $1.50 to $2; engineer from $2.50 to $3.

47 Q. 14. Have you ever used a Leschot drill for prospecting or taking out test cores in the form shown in the drawing in the Leschot patent?

A. I have used diamond drills, made in the form shown in the drawing shown in the Leschot patent, for prospecting or taking out test cores.

Q. 15. State, if you please, whether or not they have worked successfully when you have used them as you say.

A. They have worked very satisfactorily.

Q. 16. In what stone have you used them?

A. In nearly every kind.

Q. 17. How have the diamonds stood the wear in the stones in which you have used them?

A. The wear was very light, generally speaking.

And, being cross-examined by Mr. Rice, says:

X Q. 18. For whom are you superintendent?

A. For the American Diamond Drill Company.

X Q. 19. How long have you been employed by them?

A. For a little over two years.

X Q. 20. Have you in that time had anything to do with quarrying stone or marble; and, if so, what?

A. I have had nothing to do with quarrying marble in that time, but I have had in quarrying granite in Maine.

X Q. 21. Either in channelling or gadding?

A. Neither.

X Q. 22. What class of work, then?

A. Holes for blasting.

X Q. 23. What were you engaged in before you were employed as superintendent of the American Diamond Drill Company?

A. I was superintendent of the Pennsylvania Diamond Drill Company—a company working under the Leschot patents and manufacturing and using diamond drills.

X Q. 24. How long were you connected with the Pennsylvania Diamond Drill Company?

A. For a little more than a year.

X Q. 25. During that time what, if anything, did you have to do with quarrying marble or stone?

48 A. Nothing with marble and nothing in gadding or channelling in other quarrying.

X Q. 26. Where were you employed immediately prior to that?

A. At Windsor, Vermont; I was there for about fifteen months, connected with the Windsor Manufacturing Company, working upon channelling machines and a portion of the time upon diamond drills.

X Q. 27. When and where was your attention first called to diamond drills?

A. I first heard of gadding machines at Windsor, Vermont, January 8, 1868—somewhere about that time I first saw or heard of a Leschot drill carried into Vermont for testing quarries.

X Q. 28. When and where have you known of the Leschot drill head being used for channel cutting?

A. I think Mr. Ball used it at Sutherland Falls, to the best of my recollection.

X Q. 29. Did you see the Leschot drill in use there by him?

A. On several occasions by his men.

X Q. 30. Now, will you state when you saw the Leschot drill in use by him or his men at Sutherland Falls?

A. I should think it was some time in the spring or summer of 1868, as near as I can tell without referring to my diary.

X Q. 31. Generally, please describe that machine.

A. I think it was a six-spindle drill.

X Q. 32. How often did you see that machine, about?

A. I couldn't say positively; two or three times in the course of a month or so.

X Q. 33. When and where have you known of the Leschot drill head being used for channel cutting except upon that machine?

A. I think it was used—I have a very vague recollection of its being used at Brandon, Vermont. I saw the machine in use there, but I cannot tell positively what kind of a drill head was used. I have no recollection of any other.

49 X Q. 34. You may state when you saw the Brandon machine, as near as you can.

A. I think it was a few months after I saw the Sutherland Falls machine.

X Q. 35. What other machine used by Mr. Ball or the Sullivan Machine Company have you seen used besides those you have named?

A. I have seen them at nearly all the quarries where they were placed previous to 1873, in Vermont.

X Q. 36. Did you ever run a quarry; were you ever connected with the working of a quarry, or worked in connection with quarrying?

A. I have worked in quarries, in starting up and running Wardwell and Lawson's stone-channelling machine.

X Q. 37. Have you ever had connection in a quarry with running a diamond drill of any kind for channelling or gadding?

A. No, sir; I have seen them used, but have never run them myself.

X Q. 38. Have you ever seen any used for those purposes, excepting Mr. Ball's or the Sullivan Machine Company's machines?

A. I have seen gadding machines in the quarries, manufactured by the Windsor Manufacturing Company under the so-called Case patent.

X Q. 39. Were they successful as gadding machines?

A. I could not say. I think not. I have also seen a machine manufactured under the so-called Case patent—I think made in Syracuse—and I have heard it was working in a very satisfactory manner.

X Q. 40. What drill head was used in connection with the Case machine?

A. I think a diamond-pointed convex head.

X Q. 41. How do you come at the expense of running the diamond channelling machine?

A. It was by hearsay that I came at the expense of running the diamond channelling machine.

X Q. 42. Did the data you have given in that respect relate to any other channelling machine except those of Mr. Ball's?

A. No, sir; that was the machine in question.

X Q. 43. Do you know whether or not in that machine there are inventions and patents held for other devices than the drill head?

A. There are inventions connected with that machine besides the drill head, which are claimed by both parties, and for which both parties claim patents.

X Q. 44. Will you please state what other device connected with that machine there is which is an invention claimed by the American Drill Company apart from the drill head?

A. The hollow drill rod and a stream of water.

X Q. 45. Is the drill rod the same as that claimed by Leschot?

A. In that it is hollow, it is the same.

X Q. 46. What other elements enter into the cost of channel cutting by diamond drills besides the cost of the labor of running the machine?

A. The cost of the machine, and fuel, oil, wear and tear—the handling of the machine.

X Q. 47. Do you know anything about these things in respect to this machine?

A. I do not know any definite data.

X Q. 48. When were you last at the Sutherland Falls quarry?

A. I think in the summer of 1871 and again in the winter following, to the best of my recollection.

X Q. 49. What machines did you see there at that time using the diamond drill for channelling or gadding?

A. The 6-spindle drill was lying still, I think. They were using two of Mr. Ball's gadding machines.

X Q. 50. Did those machines use a Leschot drill head?

A. I think not. They used the solid convex head, I think.

X Q. 51. During that season or since that time have you seen any other drill head except the solid convex head used in their machines?

A. I do not now remember of seeing any other heads in use.

X Q. 52. What drill heads do the American Diamond Drill Co. manufacture?

51 A. They manufacture the hollow or annular bit under the Leschot patent; also a concave bit under my own patent. These are the only drill bits manufactured since I have been connected with that company except one or two others by way of experiment. These drill bits range in diameter from one inch to three inches. I have made a drill bit nine inches in diameter, leaving a core about eight inches in diameter.

X Q. 53. You may state how that drill bit was driven.

A. It was driven by a $2\frac{1}{4}$ or $2\frac{1}{2}$ inch hollow tubing or gas pipe.

X Q. 54. You bored with that 18 feet, you think?

A. 18 feet, I think, as an experiment.

X Q. 55. How long was the cylinder or boring or core bar in that case?

A. I think we started with a four-foot core bar and afterwards used a seven or eight foot bar, to the best of my recollection. This bar was attached to the $2\frac{1}{2}$-inch inside diameter drill rod by reducing coupling. The outside diameter would be $2\frac{7}{8}$ or 3 inches.

X Q. 56. Now, will you please state, in setting the diamonds in that case, what interior and what exterior clearance you gave.

A. My opinion is it was $\frac{1}{32}$d of an inch inside and outside; that is now our usual clearance.

And, being further examined by Mr. BLAKE, says:

Re-D. Q. 57. In what you have called the solid-head drills, were there holes to admit the passage of water?

A. Certainly there were.

M. A. BULLOCK.

Sworn and subscribed to this 8th day of December, A. D. 1873.
E. G. THOMPSON, *Examiner*.

New York, *February* 16, 1874—2 p. m.

Present: Counsel for both parties.

Henry B. Renwick, being recalled as a witness on the part of the complainants, in answer to interrogatories propounded by Mr. Blake, says:

Q. 1. Please look at Defendants' Exhibit F and the translation from the French purporting to describe the mode of operation of the devices there shown and compare it with the devices described in combination in the third claim of the Leschot reissue, 3690.

A. I have frequently looked at Defendants' Exhibits F and E, the former of which purports to be a copy from the drawings of "Le Technologiste," June 8, 1846–'7, plate 86, and the latter of which, Exhibit E, purports to be a translation of the letter-press in the same volume which refers to this drawing. This letter-press and drawing describes a machine for boring artesian wells, as far as I can judge, through earth or some soft formation, the boring tool being, as it appears from the drawing, not suitable for boring hard rock.

The boring head which carries the cutters is attached to a tubular boring bar, through which water is to be forced down by means of a proper pump and hose. The place of exit for the water is not through the boring head, as in the contrivance described in Complainants' Exhibit No. 1 (being the patent granted to Severance for the invention of Leschot), but the place of exit is, on the contrary, above the boring head and above all the cutters. I have never seen the Leschot machine altered so as to permit the escape of water above the boring head, as in Defendants' Exhibits E and F, but think that the Leschot tool would not work practically under such an arrangement. The boring apparatus referred to in the third claim of the Severance patent must have a revolving and progressive motion, such as is set forth in the specification, the diamonds abrading the rock in consequence of the motion of revolution, and being
53 fed slowly forward so as to attack fresh surfaces of rock.
There is no such motion described in Defendants' Exhibits E and F.

The drawings and the description both show that the tool of these Exhibits E and F is to act by percussion in the same way as a steel rock drill is acted upon by a sledge-hammer.

Exhibit E states that "the borer is impressed with a motion of rotation by means of a wrench or of percussion by a windlass with disengaging arrangements like that of a pile-driver," and also that "the gin and the windlass to raise, let fall, and sustain the borer do not present any peculiarity." The borer therefore works as the hammer of a pile-driver would under a mode of operation and by means of machinery wholly different from that mentioned in the reissued patent to Severance, and such machinery and mode of operation would, in my opinion, destroy the complainants' or defendants' diamond-pointed boring head. It is true that the Exhibits E and F do describe a wrench by means of which the boring rod and consequently the boring head can be turned; but this turning, as I understand it, is not to be a constant turning to cause the tool to bore, but is to be an occasional turning, taking place while the boring rod is rising or in its uppermost position, and serving merely to cause the cutters to strike by their percussive action in a different spot. This turning is like that imparted to an ordinary steel rock drill by the man who holds it while he is lifting it up and before the blow is struck by the sledge.

It is manifest that it would be impossible to turn the boring tool of Exhibits E and F while the ram of the pile-driver and the boring rod were descending or while the boring head with its cutters was stuck in the dirt or formation, as Exhibit F sometimes calls it.

In the Leschot contrivance, referred to in claim 3, the boring motion must not be intermittent and occasional, as in Exhibits E and F, but must be continuous, as the boring is done by the continuous rotating motion.

In my opinion, these Exhibits E and F do not describe the apparatus referred to in the third claim of Complainants' Exhibit No. 1 nor an equivalent thereof.

54 Q. 2. What inconveniences in boring in rock would ensue from the fact that the holes in the tubular boring bar in Exhibit F are above the cutters?

A. I do not think that Exhibit F is meant for boring in rock. If it were applied with proper cutters to the boring of rock I doubt if the detritus could be washed away under the arrangement for the exit of water there shown; but I am not sure on this point, as it is obvious that a boring tool worked by a percussive motion, as Exhibit F is, would by that very motion stir up the detritus and water at the bottom of the hole, so that all of it would be carried off by water having its exit above the boring head. This provision for exit of water above the boring head might be operative with a percussive tool, while at the same time it would be wholly inoperative with a revolving abrading tool.

And, being cross-examined by Mr. E. T. Rice, says:

X Q. 3. When did you first see the Defendants' Exhibits E and F?

A. I cannot tell the time. It was during the examination of Mr. A. Ball, who was examined in this case. I have never seen the originals from which they purport to be taken.

HENRY B. RENWICK.

Subscribed and sworn to the 16th day of February, A. D. 1874.

E. G. THOMPSON, *Examiner*.

Examination adjourned, by consent, to new notice.

55 COMPLAINANT'S EXHIBIT No. 1. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the reissued letters patent granted Asahel J. Severance, assignee of Rudolphe Leschot, dated October 26th, 1869, No. 3690, for "improved rock drill."

In testimony whereof I, M. D. Leggett, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-first day of August, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] M. D. LEGGETT,
Commissioner.

THE UNITED STATES OF AMERICA.

No. 3690, Reissue.

To all to whom these letters patent shall come:

Whereas Asahel J. Severance, of Middlebury, Vermont, assignee, by mesne assignments, of Rudolphe Leschot, has alleged that said Rudolphe Leschot invented a new and useful improved rock drill (for which letters patent were issued to him, dated July 14, 1863, the same surrendered, and new letters issued to said assignee, dated February 16, 1869, which last letters having been surrendered by him, the same have been canceled and new letters ordered to issue to him on an amended specification), and had made oath that he was a citizen of the Republic of Geneva; that he did verily believe he was the original and first inventor or discoverer of the said invention, and that the same hath not, to his knowledge and belief, been previously known or used, said assignee having paid into the Treasury of the United States the sum of thirty dollars and
56 presented a petition to the Commissioner of Patents praying that a patent may be issued therefor:

These are therefore to grant to the said Asahel J. Severance, his executors, administrators, or assigns, for the term of seventeen years from the fourteenth day of July, one thousand eight hundred and sixty-three, the full and exclusive right and liberty of making, using, and vending to others to be used, the said invention, a description whereof is given in the annexed schedule and made a part of these presents.

In testimony whereof I have caused these letters to be made patent and the seal of the Patent Office to be hereunto affixed.

Given under my hand, at the city of Washington, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and sixty-nine, and of the Independence of the United States of America the ninety-fourth.

[L. S.] W. T. OTTO,
Acting Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.

SAM'L S. FISHER,
Commissioner of Patents.

UNITED STATES PATENT OFFICE.

ASAHEL J. SEVERANCE, of Middlebury, Vermont, Assignee, by Mesne Assignments, of Rodolphe Leschot.

Letters Patent No. 39235, dated July 14, 1863; reissue No. 3304, dated February 16, 1869; reissue No. 3690, dated October 26, 1869.

Improved Rock Drill.

The schedule referred to in these Letters Patent and making part of the same.

Be it known that Rodolphe Leschot, of Paris, in the Empire of
France, has invented a new and improved drill or tool for the boring of rocks and other hard substances; and I, Asahel J. Severance,
of Middlebury, in the State of Vermont, assignee of said invention,
do hereby declare the following to be a full, clear, and exact
57 description of the same, reference being had to the accompanying drawings, forming a part of this specification, in
which—

Figure 1 is a front view of the crown or boring head, and

Figure 2 is a side view of the same.

Similar letters of reference indicate corresponding parts in all the figures.

Heretofore the boring or drilling of rocks has been generally accomplished by means of a chisel, punch, or boring bar operated by percussion.

This invention consists in a boring tool composed of a series of diamond edges attached to an annular or tubular stock or crown of steel or other metal, to which a rotary and a direct forward motion are given, and which is thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel, which is easily detached by the subsequent operation of a gad or wedge.

It also consists in the combination with the described boring tool of a tubular boring bar or drill rod, whereby motion is imparted to the boring head, and through which a stream of water is forced, as hereinafter set forth.

The quantity of matter required to be removed by such boring tool is very small in proportion to the cavity which is formed after the withdrawal of the said kernel or core.

The advantage of this boring tool is that it may be operated with a small amount of power, is expeditious in its action, and its wear is almost imperceptible in operating upon the hardest substances.

To enable others skilled in the art to make and use my invention, I will proceed to describe it, with reference to the drawing.

A is the annular or tubular socket or crown of steel or other metal.

a a^1 a^2 are edged cutters composed of diamonds fitted and set firmly into suitable notches or mortices in the face of the crown or stock

A. These diamonds are such as, from their color, are least valuable for jewelry.

They are, respectively, so arranged in the crown or stock A
58 that the cutting edges of some project in a forward direction
from the face or front end of the said crown or stock, as illustrated by *a a*, while the edges of others project outwardly from the outward periphery thereof, as illustrated by a^1 a^1, and the edges of others project inwardly from the inner periphery, as illustrated by a^2 a^2.

This crown or stock is secured by a bayonet fastening or other means to a tubular boring bar of any suitable length whose outer diameter is not greater than that of the said crown or stock and whose inner diameter is not less than that of the said crown or stock, and this bar is arranged to form part of a machine of suitable construction or otherwise furnished with suitable mechanical appliances, according to the nature of the work to be performed, by which it has imparted to it both a rotary and a direct forward or feeding motion, whereby it is caused to cut or bore an annular groove or hole in the rock or other hard body upon which it is employed.

The operation of the tool will be greatly assisted by the injection of a stream of water through the tubular boring bar and crown or stock for the purpose of washing out and carrying away the detritus which is produced, and which would otherwise choke up the annular opening and impede the action of the tool.

This stream may be thrown in by a pump, connected by a hose with the outer or rear end of the tubular boring bar, or by any other suitable and convenient means.

When the boring has been continued to a desirable depth the bar with the attached tool is drawn out from the hole and the cylindrical kernel or core which has been left and which, as the boring operation has proceeded, has passed through the socket or stock and into the tubular bar is broken away, by driving wedges or gads into the annular hole, and then pulled out, leaving a cylindrical hole of a diameter equal to the circle described by the revolution of the edges of the diamond cutters a^1 a^1.

The same kind of tool, made of suitable calibre, may be used for
the production of solid cylinders of stone or other hard sub-
59 stance, as well as for boring, the solid cylinder being formed
in the same way as the kernel or core above described, with reference to the boring operation.

Having thus fully described this invention, what I claim as new and desire to secure by letters patent is—

1. A continuously revolving and progressing boring head, having projecting diamond points, in combination with a tubular boring bar, substantially as and for the purposes specified.

2. The row of cutting edges a^1 when attached to a revolving boring head so as to project beyond the circumference thereof for the purposes specified.

3. In combination with a revolving and progressing boring head, having cutting points projecting beyond the periphery thereof, a hollow central drill rod, through which the water is forced or passed.

4. A series of cutting edges, a a^1 a^2, arranged in the face and upon the outer and inner peripheries, respectively, of a tubular or annular bit or boring head, A, substantially as and for the purposes specified.

ASAHEL J. SEVERANCE.

Witnesses:
WM. T. HOLT.
PHILO CHASE.

COMPLAINANT'S EXHIBIT NO. 3. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Whereas Rodolphe Leschot, of Paris, in the Empire of France, did obtain letters patent of the United States for a tool for boring rocks and other hard substances, which letters patent bear date the 14th day of July, A. D. 1863; and

Whereas said letters patent were reissued on an amended specification dated February 16th, 1869, and again reissued on an amended specification dated October 26th, 1869; and

Whereas I, A. J. Severance, of Middlebury, Vermont, have, by sundry mesne assignments duly recorded in the Patent Office of the United States, become the owner of said letters patent and the beforementioned reissues thereof; and

Whereas the "New England Diamond Drill Company," a corporation duly organized and existing under the general laws of the Commonwealth of Massachusetts, are desirous of acquiring an interest therein:

Now, this indenture witnesseth: That for and in consideration of the sum of one dollar and other valuable consideration to me, the said A. J. Severance, in hand paid, the receipt of which is hereby acknowledged, I, the said A. J. Severance, of Middlebury, Vermont, have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said New England Diamond Drill Company all the right, title, and interest which I have in the said invention, as secured to me by the said letters patent and the above reissues thereof, in and for the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and New York, except the city of New York and under tidal waters everywhere, and in no other place or places; the same to be held and enjoyed by the said New

England Diamond Drill Company for its own use and behoof and for the use and behoof of its legal representatives to the full end of the term for which said letters patent are granted and for
61 any extention, reissues, or renewals thereof within the said six New England States and the State of New York, outside and exclusive of the city of New York and excepting under tidal waters everywhere.

In testimony whereof I have hereunto set my hand and affixed my seal this 27th day of October, A. D. 1869.

[5 cts. 5. A. J. S. 27 Oct., 1869. 5 cts. 5.]

A. J. SEVERANCE. [L. S.]

Signed, sealed, and delivered in the presence of—
MARCUS P. BESTON.

Recorded December 9, 1869.
Ex.: L. P. H.

COMPLAINANT'S EXHIBIT No. 4. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Assignment of Patent.

Whereas Rodolphe Leschot, of Paris, in the Empire of France, did obtain letters patent of the United States of America for certain improvements in tools for boring rock and other hard sub-
62 stances, which letters patent bear date the 14th day of July, eighteen hundred and sixty-three, and numbered 39235;

And whereas I, A. J. Severance, of Middlebury, Vermont, have, by sundry mesne assignments, become the owner of said letters patent and of the several reissues thereunder, dated February 16th, 1869, and October 26th, 1869;

And whereas William T. Holt, of New York city, is desirous of acquiring an interest therein:

Now, this indenture witnesseth: That for and in consideration of the sum of seventeen dollars to me, the said A. J. Severance, in hand paid, the receipt of which is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said William T. Holt, his heirs and assigns, forever the one undivided half part and share of all the right, title, and interest which I have in the said invention, as secured to me by said letters patent and the above-named reissues thereof; also for all extensions and renewals.

The same to be held and enjoyed by the said William T. Holt, his heirs or assigns, for their own use and behoof and for the use and behoof of their legal representatives to the full end of the term for which said letters patent are granted as fully and entirely as the same would have been held and enjoyed by me if this assignment and sale had not been made.

In testimony whereof I have hereunto set my hand and affixed my seal this twelfth day of November, eighteen hundred and sixty-nine.

[5 cts. 5. A. J. S. Nov. 12, '69. 5 cts. 5.]

A. J. SEVERANCE. [L. S.]

Sealed and delivered in presence of—
MARCUS P. BESTON,
14 *and* 16 *Wall Street, N. Y. City.*

Recorded November 24, 1869.
Ex'd: L. P. H.

63 COMPLAINANT'S EXHIBIT No. 5. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Whereas one Rudolphe Leschot, of Paris, France, did obtain letters patent of the United States of America for a certain "tool for boring rock" (commonly known as "the diamond drill"), which letters patent bear date July 14th, 1863, and are numbered 29235; and

Whereas it appears from the patent records in the Patent Office at Washington that the "New England Annular Diamond Drill Company" have acquired a certain interest in and to the said patent for the New England States and the State of New York; and

Whereas the said "New England Annular Diamond Drill Company" never purchased nor paid any consideration for said interest in the patent aforesaid; and

Whereas the instrument purporting to convey said interest to said corporation was never delivered to it nor to its officers, stockholders, nor members, but was put upon record at Washington as aforesaid by mistake and oversight; and

Whereas the said company do not claim and never have claimed any interest in or ownership of said letters patent nor any rights thereunder; and

64 Whereas one William T. Holt, of New York, has become and now is the lawful owner and holder of the said patent and all rights thereunder within the said six New England States and the State of New York (except as to the city of New York and under tide-water); and

Whereas the said Holt desires this corporation to assign, release, and quitclaim to him all and singular the right, title, claim, and interest, if any, either in law or equity, which the said company may have or be deemed to have acquired in or to the said patent in order to perfect (if necessary) his said title and ownership of said patent and to remove any cloud which may be deemed to exist as to the same because of the aforesaid recorded conveyance appearing at the Patent Office:

Now, therefore, be it remembered that, for and in consideration of one dollar to said company by him paid, receipt of which is acknowledged, the said "New England Annular Diamond Drill Company" hereby do release, quitclaim, sell, grant, assign, and set over unto him, the said William T. Holt, his assigns and legal representatives, forever all the interest, claim, right, title, or ownership, if any, which it, the said company, have in or to said patent or any reissues, improvements, or renewals pertaining thereto.

It being the object, purpose, and intent of this instrument to disclaim any and all ownership of or interest in the said patent, either in law or equity, or of any casements, rights, or privileges thereunder; and also to vest any and all of the interest which it, the said corporation, may be deemed to have (if any) fully and without reserve in the said William T. Holt, his assigns and legal representatives, forever.

And it, the said "New England Annular Diamond Drill Company," hereby covenants, for itself, successors, and assigns, with the said Holt, his assigns and legal representatives, that they will never set up, assert, nor maintain any claim to nor interest in said patent by reason of or under any assignment, writing, or contract thereto pertaining of prior date hereto.

65 In testimony whereof said company has caused these presents to be executed and delivered by the hand of its president on this twenty-fourth day of May, A. D. 1871.

The word "casements" written over erasure on third page before execution.

[5. 5. W. S. R. May 24, '71. 5. 5.]

NEW ENGLAND ANNULAR DIAMOND
DRILL CO.,
By WM. FOX RICHARDSON, *Pres't.*
A. J. SEVERANCE.

SUFFOLK, *ss:*

JUNE 22D, 1871.

Then personally appeared the said Wm. Fox Richardson, as president of the New England Annular Diamond Drill Company, and acknowledged the foregoing to be the free act and deed of said company.

Before me—

CHAS. E. JOYCE,
Justice of the Peace for Middlesex Co.

Acknowledgment.

STATE OF CALIFORNIA,
City and County of San Francisco, } *ss:*

On this seventh day of July, A. D. one thousand eight hundred and seventy-one, before me, F. O. Wegener, a notary public in and for said city and county, duly commissioned and sworn, personally appeared the within-named A. J. Severance, whose name is subscribed to the annexed instrument as a party thereto, personally known to me to be the individual described in and who executed the said annexed instrument, and said A. J. Severance acknowledged to me that he executed the same freely and voluntarily and for the uses and purposes therein mentioned.

In witness whereof I have hereunto set my hand and affixed my official seal the day and year in this certificate last above written.

[L. S.] F. O. WEGENER,
Notary Public.

Recorded Aug. 22, 1871.
Ex'r: J. A. W.

66 COMPLAINANT'S EXHIBIT No. 6. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

J. M. THACHER,
Acting Commissioner.

In consideration of one dollar to each of us in hand paid we, the undersigned, associates, corporators, and stockholders in the above-named New England Annular Diamond Drill Company, approve of the foregoing instrument and hereby release and transfer to William T. Holt all of our right, title, and interest, if any, in the patent, reissues, renewals, and improvements mentioned and described in said instrument.

Dated May 24th, 1871.

[5. 5. May 24. '71. 5. 5.]

WM. FOX RICHARDSON. [L. S.]
ABEL BALL. [L. S.]
A. J. SEVERANCE. [L. S.]

Sealed and delivered in the presence of—" in hand " interlined before execution—

CHAS. E. JOYCE.

SUFFOLK, *ss:*

JUNE 22, 1871.

67 Then personally appeared the said Wm. Fox Richardson and acknowledged the foregoing to be his free act and deed. Before me—

CHAS. E. JOYCE,
Justice of the Peace for Middlesex Co.

Acknowledgment.

STATE OF CALIFORNIA,
City and County of San Francisco, } *ss:*

On this seventh day of July, A. D. one thousand eight hundred and seventy-one, before me, F. O. Wegener, a notary public in and for said city and county, duly commissioned and sworn, personally appeared the within-named A. J. Severance, whose name is subscribed to the annexed instrument as a party thereto, personally known to me to be the individual described in and who executed the said annexed instrument, and said A. J. Severance acknowledged to me that he executed the same freely and voluntarily and for the uses and purposes therein mentioned.

In witness whereof I have hereunto set my hand and affixed my official seal the day and year above written.

[L. S.] F. O. WEGENER,
Notary Public.

COMMONWEALTH OF MASSACHUSETTS,
County of Suffolk, } *ss:*

On this first day of August, A. D. 1871, personally appeared before me, the subscriber, a notary public within and for said county of Suffolk, Abel Ball, known to me to be the person who executed the within instrument by that name, who, being duly sworn, deposes and says that he was one of the associate incorporators with the said Wm. Fox Richardson and A. J. Severance of the within named New England Annular Diamond Drill Company, and that 68 he executed the within instrument of assignment freely and voluntarily for the purposes therein mentioned.

[L. S.] CALVIN P. HINDS,
Notary Public.

Recorded August 22d, 1871.
Ex'd: J. A. W.

COMPLAINANT'S EXHIBIT NO. 7. E. G. T. Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Assignment of Patent Right.

To all whom it may concern:

Whereas Rodolphe Leschot, of the city of Paris, in the Empire of France, did obtain letters patent of the United States for an improved tool for boring rock, &c., which letters patent bear date July
14th, A. D. 1863, and numbered 39235, which letters patent
69 were afterwards reissued to A. J. Severance, of Middlebury,
Vermont, in the United States;

And whereas a corporation known as the New England Diamond Drill Company of Boston, in the county of Suffolk and State of Massachusetts, have become and now are the owners of the above-described invention for, to, and in the hereinafter-named territory;

And whereas William T. Holt, of New York, is desirous of acquiring an interest therein:

Now, this indenture witnesseth: That for a valuable consideration, viz., the sum of one dollar and other valuable considerations to it, the said corporation, in hand to its treasurer paid, the receipt of which is hereby acknowledged, it has assigned, sold, and set over, and by these presents do assign, sell, and set over, unto the said William T. Holt aforesaid all the right, title, and interest it has in the above-described invention as secured to the said Leschot and his assigns by letters patent for, to, and in the following States, to wit: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and the State of New York, except in the city of New York and under tide-water everywhere, which is also excepted from this assignment, being owned by Severance and Holt, New York, and in no other place or places.

The same to be held and enjoyed by the said William T. Holt, of city, county, and State of New York, for his own use and behoof and for the use and behoof of his legal representatives to the full end of the term for which said letters were granted as fully and entirely as the same would have been held and enjoyed by it, the said corporation, had this assignment and sale not been made.

In testimony whereof it, the said corporation, has caused its president to hereunto set his hand and affix the corporate seal of said

company this twenty-fifth day of May, in the year of our Lord one
thousand eight hundred and seventy-one; also caused the same
70 to be countersigned by the treasurer of said company by vote
duly passed and recorded in books of said company.

[5. 5. N. Eng. D. D. Co. May 25, 1871. 5. 5.]

THE NEW ENGLAND DIAMOND
DRILL CO.,
By L. GULLIVER, *Pres't.* [L. S.]

Countersigned by—
WM. FOX RICHARDSON, *Treas.* [L. S.]

Sealed and delivered in presence of—witnesses:
H. CUTLER.

Recorded June 5, 1871.
Ex'd: A. E. B.

COMPLAINANT'S EXHIBIT No. 8. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this Office.

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Whereas Rodolphe Leschot, of Paris, France, did obtain letters patent of the United States of America for a new and useful "tool boring rock," which letters patent bear date the fourteenth day of July, A. D. 1863, and are numbered 39235;

And whereas William T. Holt, of the city of New York,
71 and A. J. Severance, of Middlebury, Vermont, have, by sun-
dry mesne assignments, become and are the owners of the said
letters patent and of the several reissues thereunder, dated February
16, 1869, and October 26, 1869:

[5. 5. W. T. H. June 2, 1871. 5. 5.]

Now, this indenture witnesseth: That for and in consideration of the sum of two hundred and twenty-five thousand dollars of the stock of the American Diamond Drill Company to me, the said William T. Holt, in hand paid by the American Diamond Drill Company, the receipt of which is hereby acknowledged, I have bargained, sold, and assigned, and by these presents do convey, transfer, and set over, unto the said American Diamond Drill Company, their successors and assigns, the said letters patent and said reissues and all renewals thereof, together with the sole and exclusive right to make, construct, use, and vend to others to be used, the said "tool for boring rock," otherwise called the "diamond drill," in and throughout all the States, Territories, and districts of the United States, excepting the States of Pennsylvania, Indiana, Illinois, Iowa, Minnesota, Michigan, California, Nevada, Oregon, and the Territories of Washington and Montana.

And I hereby assign and transfer to the said American Diamond Drill Company and their successors and assigns any improvement, invention, or future patent I may make, have, or obtain of, in, or upon said tools or drills.

And I do hereby grant and assign unto the said American Diamond Drill Company, their successors and assigns, forever all the right, title, and interest which I, the said William T. Holt, either individually or as a partner with A. J. Severance or otherwise, now have or might ever hereafter claim in the said letters patent and in any reissues or renewals thereof, so far as the same relate to the said States, Territories, and districts of the United States not hereinbefore excepted.

The said interest which I hereby convey is as follows, to wit: The said patent and all reissues, renewals, improvements, and extensions thereof, together with the entire exclusive right to make, 72 construct, use, and vend to others to be used, the said "tool for boring rock" under said letters patent and reissues, renewals, improvements, and extension thereof, in the following States, to wit: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and in the State of New York, outside and exclusive of the city of New York and excepting under tide-water everywhere.

And also the equal and undivided one-half of said letters patent, reissues, renewals, extensions, and improvements thereof or pertaining thereto, and one undivided half of said exclusive right to make, construct, use, and vend to others to be used, the said "tool" under said letters patent, reissues, renewals, extensions, and improvements in the city of New York and in all the other States, Territories, and districts of the United States, and under all tidal, lake, and river waters within the United States, except in the States of Pennsylvania, Indiana, Illinois, Iowa, Minnesota, Michigan, California, Nevada, Oregon, and the Territories of Washington and Montana, and except under the tidal, lake, and river waters within the jurisdiction of the said excepted States, within whose boundaries no right under said patent is intended to be hereby conveyed.

And I, the said William T. Holt, for myself, my heirs, executors, and administrators, do hereby covenant with the said American Diamond Drill Company, their successors and assigns, that I have not granted, sold, or assigned to any other person or persons any right or interest to or in said patent or in any reissues or renewals thereof outside of or beyond the several States and parts of States hereinbefore enumerated and excepted from this assignment, except the use of drills heretofore actually constructed and sold and the specific rights conferred at the time in respect to the use of such specific drills, of which a list in writing shall be furnished without delay to said company, and that the said A. J. Severance and myself have a good title to and are lawfully possessed every elsewhere in these United States of said letters patent and of said reissues and renewals thereof, and of all the rights and privileges which do or may thereto pertain unimpaired.

73 And I also covenant as aforesaid that I have a good title to all the premises hereinbefore described and granted, and that I will warrant and defend the same against the claims and demands of any and all persons whatever who shall or may claim the same against the said American Diamond Drill Company, their successors or assigns.

The said letters patent and said renewals, reissues, improvements, and all rights and interests hereby conveyed to be held and enjoyed by the said American Diamond Drill Company for their own use and behoof and for the use and behoof of their successors and assigns to the full end of the term for which said letters patent and any reissues, renewals, or improvements thereof are or may be granted as fully and entirely as the same would have been held and enjoyed by me if this assignment and sale had not been made.

In testimony whereof I have hereunto set my hand and affixed my seal this second day of June, one thousand eight hundred and seventy-one.

[5. 5. W. T. H. June 2, 1871. 5. 5.]

WM. T. HOLT. [L. S.]

Sealed and delivered in the presence of—
RICHARD STACKPOOLE.

STATE OF NEW YORK,
City and County of New York, } *ss:*

On the second day of June, 1871, before me came William T. Holt, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged to me that he executed the same.

Witness my hand and notarial seal the day and year last above written.

[L. S.] RICHARD STACKPOOLE,
Notary Public.

Recorded Aug. 15, 1871.
Ex'd: J. A. W.

74 COMPLAINANT'S EXHIBIT No. 9. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, J. M. Thacher, acting Commissioner of

Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of March, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-seventh.

[L. S.] J. M. THACHER,
Acting Commissioner.

Whereas Rodolphe Leschot, of Paris, France, did obtain letters patent of the United States of America for a new and useful "tool for boring rock," which letters patent bear date the fourteenth day of July, A. D. 1863, and are numbered 39235;

And whereas A. J. Severance, of Middlebury, Vermont, and William T. Holt, of the city of New York, have, by sundry mesne assignments, become and are the owners of the said letters patent and of the several reissues thereunder, dated February 16, 1869, and October 26, 1869;

Now, this indenture witnesseth: That for and in consideration of the sum of two hundred and twenty-five thousand dollars of the stock of the American Diamond Drill Company to me, the said A. J. Severance, in hand paid by the American Diamond Drill Company, the receipt of which is hereby acknowledged, I have bargained, sold, and assigned, and by these presents do convey, transfer, and set over, unto the said American Diamond Drill Company, their successors and assigns, the said letters patent and said reissues and all renewals thereof, together with the sole and exclusive right to make, construct, use, and vend to others to be used, the said "tool for boring
75 rock," otherwise called the diamond drill, in and throughout all the States, Territories, and districts of the United States, excepting the States of Pennsylvania, Indiana, Illinois, Iowa, Minnesota, Michigan, California, Nevada, Oregon, and the Territories of Washington and Montana.

[5. 5. A. J. S. June, 1871. 5. 5.]

And I hereby assign and transfer to said American Diamond Drill Company, their successors and assigns, any improvement, invention, or future patent I may make, have, or obtain of, in, or upon said tools or drills.

5 5 And I do hereby grant and assign unto the said The
A. J. S. American Diamond Drill Company, their successors and
June, assigns, forever all the right, title, and interest which I,
1871. the said A. J. Severance, either individually or as a part-
5 5 ner with said William T. Holt or otherwise, now have or
might ever hereafter claim in the said letters patent and
5 5 in any reissues or renewals thereof, so far as the same re-
A. J. S. late to all of the States, Territories, and districts of the
June, United States, except the said States of Pennsylvania, In-
1871. diana, Illinois, Iowa, Minnesota, Michigan, California,
5 5 Nevada, Oregon, and the Territories of Washington and
Montana.

The said interest which I hereby convey is as follows, to wit: The said patent and all renewals, improvements, and extensions thereof

or pertaining thereto, and one undivided half of the exclusive right
to make, construct, use, and vend to others to be used, the
5 5 said tool under said letters patent, reissues, renewals, ex-
A. J. S. tensions, and improvements in the State of New York, and
June, in all the States, Territories, and districts of the United
1871. States, and under all tidal, lake, and river waters within
5 5 the United States except in the States of Pennsylvania,
Indiana, Illinois, Iowa, Minnesota, Michigan, California,
Nevada, Oregon, and the Territories of Washington and Mon-
76 tana, and except under the tidal, lake, and river waters within
the jurisdiction of said excepted States, within whose
5 5 boundaries no right under said patent is intended to be
A. J. S. hereby conveyed, and except in the States of Maine, New
June, Hampshire, Vermont, Massachusetts, Rhode Island, Con-
1871. necticut, and in State of New York outside and exclusive
5 5 of the city of New York.

And I, the said A. J. Severance, for myself, my heirs, executors, and administrators, do hereby covenant with the said American Diamond Drill Company, their successors and assigns, that I have not granted, sold, or assigned to any other person or persons any right or interest to or in said patent or in any reissues or renewals thereof outside of or beyond the several States and parts of States hereinbefore enumerated and excepted from this assignment, except the use of drills heretofore actually constructed and sold and the specific rights conferred at the time in respect to the use of such specific drills, of which a list in writing shall be furnished without delay to said company, and that the said William T. Holt and myself have a good title to and are lawfully possessed every elsewhere in these United States of said letters patent and of said reissues and renewals thereof and of all the rights and privileges which do or may thereto pertain unimpaired.

And I also covenant, as aforesaid, that I have a good title to all the premises hereinbefore described and granted, and that I warrant and defend the same against the claims and demands of any and all persons whatsoever who shall or may claim the same against the said American Diamond Drill Company, their successors or assigns, the said letters patent and said renewals, reissues, improvements, and all rights and interests hereby conveyed to be held and enjoyed by the said American Diamond Drill Company for their own use and behoof and for the use and behoof of their successors and assigns to the full end of the term for which the said letters patent
and any reissues, renewals, or improvements thereof are or
77 may be granted as fully and entirely as the same would have
been held and enjoyed by me if this assignment and sale had
not been made.

[5. 5. A. J. S. June, 1871. 5. 5.]

In testimony whereof I have hereunto set my hand and affixed my seal this second day of June, one thousand eight hundred and seventy-one.

A. J. SEVERANCE. [L. S.]

Sealed and delivered in the presence of—
L. A. GOULD.

Recorded Aug. 15, 1871.
Ex'd: J. A. W.

77½ *Defendant's Proofs.*

78 Circuit Court of the United States, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL CO.
vs.
THE SULLIVAN MACHINE CO.

Proofs for final hearing in the above-entitled cause on the part of the defendant, taken before Edward G. Thompson, one of the examiners of the court, under and pursuant to the 67th rule in equity, as amended.

NEW YORK, *November 28th*, 1873—11 a. m.

Adjourned, by consent of counsel, till December 5, 1873, at 11 a. m.

NEW YORK, *December 5th*, 1873—11 a. m.

Present: Mr. E. T. Rice, of counsel with defendant, and Mr. Blake, of counsel with complainant.

ALBERT BALL, a witness produced on the part of the defendant, being first duly sworn, in answer to interrogatories propounded by Mr. RICE says as follows:

1 Q. What is your name, age, residence, and occupation?

A. Albert Ball; I am 38 years of age; I reside at Claremont, New Hampshire; I am a machinist and draughtsman; I am also an inventor of fire-arms and machines for making ammunition, polishing machinery, and of machines for boring and drilling stone.

2 Q. How long have you been a machinist and draughtsman?

A. For fifteen years.

3 Q. Please state whether or not you have obtained patents for any of your inventions.

79 A. I have obtained patents for all I ever applied for.

4 Q. Are you familiar with the tool known as the Leschot boring tool?

A. I am.

5 Q. How long have you been familiar with that?

A. Since October, 1868, or about that time—I might say the summer of 1868.

6 Q. Immediately prior to that time in what business were you engaged?

A. In designing stone-channelling machines at Windsor, Vermont.

7 Q. What particularly directed your attention to the Leschot tool?

A. I was constructing a machine for channel cutting by drilling a series of holes. That machine was constructed with reference to carrying six drills in line, two gangs of three each on each side of the machine.

8 Q. And what drill did you propose to use, and under what authority?

A. The Leschot drill, under the authority of Ashael Severance of the firm of Reynolds & Severance, who claimed to own the Leschot patent or an interest in it.

9 Q. Where did you attempt to make this use, and in what?

A. At Sutherland Falls, Vermont, and in a marble quarry. Sutherland Falls is in the town of Rutland.

10 Q. The machines for working these tools were patented by whom?

A. Jointly by myself and Mr. R. W. Love.

11 Q. What was the result in respect to the use of the Leschot tool in that machine?

A. We ran the machine about two months with the Leschot tool and found great difficulty in keeping the spindles or boring bars free from the cores within the tube and a severe chatter of the tube caused by cutting uneven matter in the rock.

12 Q. What do you mean by the word chatter?

A. The vibration of the bar, causing the bar to vibrate as the diamond or cutting surface passed over materials of varying hardness.

80 13 Q. What effect did that have upon the operation of drilling or the working of the machine?

A. It had a tendency to take out the diamonds and loose the splines in the quill driving the boring bar or spindle.

14 Q. Please state what was the result in respect of the use of the Leschot drill with that machine.

A. We had to abandon the use of it.

15 Q. Who owned that machine then?

A. R. W. Love.

16 Q. What did you then do in respect to that machine?

A. Mr. Love then bought the right to manufacture the drill heads or bits under the patent of Grier and Boyd, of Pennsylvania.

17 Q. Please look at Complainant's Exhibit No. 2 and state what that is.

A. This is a drill bit as manufactured under the patent of Grier and Boyd by the Sullivan Machine Co. This company was organized in the summer of 1869.

18 Q. What, if any, connection have you with that company?

A. I am a stockholder, director, and superintendent.

19 Q. Who hold your patents and inventions in respect to drilling?

A. The Sullivan Machine Co.

20 Q. You have examined the original Leschot patent, have you not?

A. I have.

21 Q. Please state in what respect, if any, the drill head, Com-

plainant's Exhibit No. 2, infringes the Leschot drill bit as described and patented by him.

A. I do not think it infringes it in any respect.

22 Q. Please look at Defendant's Exhibit A, purporting to be a copy of the original Leschot specification, and state what by that is claimed as the invention.

A. A tool for boring or cutting rock or other hard substances, composed of an annular or tubular stock or crown armed with a series of diamonds.

23 Q. What do you understand by crown or stock?

A. The part in which the diamonds are set.

81 24 Q. What, if anything, else is shown by the drawings annexed to that exhibit?

A. I see nothing else.

25 Q. Has Complainant's Exhibit No. 2 an annular or tubular stock or crown?

A. It has not. This is formed of an iron boss having a raised center sufficient to keep the outside diamonds from cutting in starting the drill. It has diamonds arranged from the center to the circumference or periphery, so as to cut all the stock or material to be bored, which will allow the head or crown to pass into the rock in the operation of boring.

26 Q. Look again at the drawing of Defendant's Exhibit A and state what, if any, novelty or invention there was in arranging the diamonds *a'* so as to cut the material to be bored outside the circumference of the boring bar or crown in July, 1863.

A. I do not see any novelty in that way of cutting. All of the instruments for boring prior to that time had a projecting edge or edges sufficient to allow the carrying of the shank of the cutting stock or bar into the hole bored.

27 Q. Can you name any tools that you were familiar with prior to that time so arranged?

A. Drills for drilling iron and for boring wood.

28 Q. Please look at Defendant's Exhibit D and state what, if any, tools you find there so arranged in the drawing or tracing attached thereto.

A. In this exhibit I find a line drawing, No. 3, which represents a tool for boring various substances, more particularly stone or iron. This drawing represents a shank armed with a flat cutting point of diamond, which projects beyond the shank in each way from the center.

29 Q. Please state what space, if any, that tool would leave between the shank and the wall of the hole bored.

A. The drawing represents an annular space of about $\frac{1}{32}$d of an inch.

30 Q. What, if any, other tool do you find in that drawing so arranged as to cut a space outside the circumference of the crown or bit?

82 A. The figure No. 9.

31 Q. Describe that tool.

A. Figure No. 9 is a drawing showing a hollow tubular crown armed with diamonds so arranged to cut an annular groove by having diamonds projecting outwardly from the stock or crown; also inwardly from the stock, so that when revolved it will cut an annular groove which will allow the crown to follow the cutting points as they advance through the substance cut.

32 Q. Please state which of the diamonds there represented, if any, cut outside the circumference of the crown.

A. The two in the lower part of the figure—that is, the one to the right and the one nearest to me as I hold the drawing.

33 Q. Please state also what, if any, novelty was there in a tubular boring bar in July, 1863.

A. Not any.

(Counsel for defendant offers in evidence a translation from the Le Technologiste, tome 8, for the year 1847, page 87, marked Defendant's Exhibit E., E. G. T., Ex'r; also certified office copy from the "bound vols." of French patents in the library of the U. S. Patent Office, marked Defendant's Exhibit F., E. G. T., Ex'r.)

34 Q. Please look at Defendant's Exhibit F of this date and state what is there shown.

A. Figure 26 represents a side view of a hollow boring tube or bar; figure 28 an end or top view of a tubular boring bar having attached cutting points or edges which project beyond the outer circumference of the tube or bar sufficiently to allow the tube or boring bar to follow the cutting edges. Figure 25 represents a frame arranged to support the boring bar and tubes to convey water to the boring bar in such a manner as to allow an upward and downward motion and also a rotary motion of the boring bar. It is arranged with a pump and connected in such a manner as to allow a stream of water to be forced downward through the boring bar so as
83 to wash out the debris cut by the point of the tool. It is further arranged with a gear or wrench for revolving the rod or boring bar.

35 Q. What does figure 29 represent?

A. Figure 29 represents an end view of a boring bar having attached four cutting points projecting from the periphery of the boring bar for increasing the size of the hole bored by the tool represented in figure 26.

36 Q. Why do you say that the two diamonds you have named in Defendant's Exhibit D project outside the circumference of the boring crown?

A. Because the lines representing the diamonds run down outside the line of the crown, showing an end view of the diamonds alone outside the circumference of the crown.

37 Q. What, if any, practical difficulty do you see in working a tool like figure 9?

A. It would be the same difficulty I have described in using a Leschot drill; not otherwise.

And, being cross-examined by Mr. BLAKE, says:

38 X Q. Please look again at figure 26 of Defendant's Exhibit F

and say whether it does not represent a section instead of a side view.

A. It is a sectional side view.

39 X Q. As a draughtsman do you not know the difference between a section and a side view; I mean generally?

A. A section view, as I understand it, is cutting an object through the center; a side view is showing a view of the outside of an object.

40 X Q. Now, is figure 26 a section or a side view?

A. I should call it a sectional view.

41 X Q. What do the outside vertical lines of figure 26 represent; I mean above the boring head?

A. They represent stiffeners for the tube.

42 X Q. What does figure 27 represent?

A. I should say figure 27 represents the mode of attaching the cutting point or parts to the end of the boring bar?

43 X Q. Are you not mistaken about figure 29; does it not represent the boring bar with its stiffeners instead of cutting points for increasing the size of the hole?

84 A. It may be so.

44 X Q. Are you familiar with the usual method of boring artesian wells?

A. I never saw one put down to any great depth. I have only seen them go down ten or twelve feet. That is all I know about them. I know they are bored by percussion.

45 X Q. Point out in the drawings in Exhibit F the provision for the escape of the water below the cutters.

A. There is none below the cutters.

(Counsel for complainant does not admit that Defendant's Exhibit E is a correct translation from the volume referred to.)

(Counsel for defendant reserves the right to produce the original work in evidence.)

ALBERT BALL.

Sworn and subscribed to this 5th day of December, 1873.

E. G. THOMPSON, *Examiner.*

Adjourned to December 8th, 1873, at 11 a. m.

NEW YORK, *December 8th*, 1873—11 a. m.

Present: Counsel for both parties.

ALBERT BALL, being recalled as a witness on the part of the defendant, in answer to interrogatories propounded by Mr. RICE deposes and says:

1 Q. In your direct testimony, in answer to question 10, you stated: "Jointly by myself and Mr. R. W. Love." What, if any, correction do you wish to make in that answer?

A. It should have been by R. W. Love alone, and not jointly.

2 Q. You alluded to your first machine as having been placed in the Sutherland Falls quarry. What other machines have you placed in that quarry?

85 A. Two gadding machines, which carry but one drill each, and a two-spindle channelling machine.

3 Q. Those machines have been at work in that quarry up to what time?

A. Present time.

4 Q. When did you first hear of any infringement in your machine upon the Leschot?

A. I think it was in the spring of 1870.

5 Q. When you changed the heads of the first channelling machine you made what other change did you make?

A. I changed the spindles by putting in 6 new spindles with smaller bore, so as to get more strength or stiffness of tube or spindle.

6 Q. Will you again look at Exhibit number—Defendant's Exhibit F, drawing—and state whether or not there would be any difficulty in having the water ejected from the drill rod above the cutting parts of the tool, as there represented, so as to have the cuttings or detritus washed out by the water so injected into the hole?

A. I think there would not be any difficulty in washing out the detritus or cuttings as the water flows down through the boring bar if it had sufficient volume or force. I have made several experiments with chilled and steel cutting points being inserted in an ordinary crown, as shown in Exhibit 2, instead of diamonds, and in that case the steel was in one piece, extending crosswise of the head from side to side, and extending forward sufficiently to be sharpened as the common machinist's flat drill. The water was injected through the boss or drill head, not as in Exhibit 2, but through openings on each side of the inserted plate or point, but above the cutting parts, and I found no difficulty in washing out the cuttings or detritus. There was also used with that last-described drill a current of air, which cleared away the cuttings equally well as the water. We cut with that drill in marble asbestos, and it will run in slate rock, soapstone, or any other soft rock with ease.

7 Q. What outside clearance do you usually give to in your machines working in marble when diamonds are used in the drill heads?

86 A. The heads for the gadders we give not far from $\frac{1}{64}$ of an inch, and find that they drill much straighter with small clearance. As to the other machines, we use a patent device, designed and patented by George F. Case, which is a collar or sleeve, which is applied just above the crown or head within $\frac{5}{8}$ of an inch of the outside cutting point and is there held by a stem made of steel, which is one inch in diameter, where a head is an inch and three-quarters in diameter. The stem extends back from the crown a distance of three inches, or nearly so; then is threaded to receive a coupling, which cannot be screwed down the stem to pinch the collar or sleeve. This sleeve is left free to revolve or stand still on the stem, as it may come in contact with the side of the walls of the hole boring. This sleeve serves as a guide for the drill point when in operation. This guide or sleeve is corrugated on its outside to allow the escape of water and cuttings, the exterior parts of the cor-

rugation forming the guide to the drill. In these machines the clearance is about $\frac{1}{32}$, except that in these machines the difference is made up by the collar, which nearly fills the hole.

8 Q. Please state to what particular use your machines are adapted.

A. These machines are adapted to quarrying uses especially.

9 Q. Do you know of any other drilling machines where diamonds are used successfully applied to quarrying uses, such as channel cutting or gadding?

A. I know of but one, one made by G. F. Case, and now running in Sheldon and Slosson's quarry, in West Rutland, Vermont.

10 Q. Please state whether or not there are other patents than that you have referred to as Mr. Case's collar which relate to particular parts of the machines manufactured by your company besides the drill heads.

A. There are other Case patents and Grier & Boyd patents which we hold, besides some taken out by the company or by Mr. Love or by myself and assigned to the company.

11 Q. State what, if any, advantage you get in channel cutting or gadding by the use of such devices.

87 A. We do get advantages by their rapid work, reducing the cost of the same kind of work as performed by hand labor or other machines without such devices; also by the ease of handling and changing the machine from place to place.

ALBERT BALL.

Subscribed and sworn to this 8th day of December, A. D. 1873.

E. G. THOMPSON,
Examiner, &c.

Adjourned, by consent of counsel, to new notice.

New York, *January* 28, 1874—11 a. m.

Present: Counsel for both parties.

Roger W. Love, a witness produced on the part of defendant, being first duly sworn, in answer to interrogatories propounded by Mr. Rice says:

1 Q. What is your name, age, residence, and occupation?

A. Roger W. Love; I am 31 years of age; I reside at Claremont, New Hampshire; I am the treasurer of the Sullivan Machine Co.

(Counsel for defendant offers in evidence an exemplified duplicate of the Leschot model, deposited and filed in the original application of Leschot for a patent for "tool for boring rock" in the U. S. Patent Office, marked Defendant's Exhibit No. 50, E. G. T., Ex'r.)

2 Q. How long have you been connected with that company as its treasurer?

A. Since its formation, in January, 1869.

3 Q. Are you familiar with tools and machinery for rock boring?

A. I am.

4 Q. How long have you been so?

88 A. For about seven years.

5 Q. Do you know the tool known as the Leschot boring tool? And, if yea, state how long you have been familiar with that.

A. I do, and have known it since 1867.

6 Q. What first called your attention to the Leschot boring tool?

A. We expected to use it in our drilling machine, and became familiar with it in connection with inquiries about it that year. We had a machine in which we expected to use revolving borers with diamond cutters, particularly for the purpose of channelling marble. We knew of a machine in use among the quarries which used the Leschot drill, and originally intended applying this Leschot diamond drill to our channelling machine. Our machine was a patented machine, patented in December, 1867, by myself and Albert Ball.

7 Q. With whom were you brought in contact in respect to the Leschot tool?

A. A. J. Severance, John B. Reynolds; and later with Mr. Wm. T. Holt, the partner of Mr. Severance.

8 Q. What arrangement did you have with them in regard to your experiments with the Leschot tool, if any?

A. Reynolds and Severance wrote us a letter stating that they were willing we should use their drill bit while experimenting with our first machine.

(Letter produced and marked Defendant's Exhibit No. 51, E. G. T., Ex'r.)

9 Q. Where was your first machine first sent for trial?

A. To the quarries of the Sutherland Falls Marble Co., at Sutherland Falls, Vermont.

10 Q. Please state whether or not if you know whether Messrs. Reynolds and Severance were interested in that quarry; and, if so, in what capacity?

A. They were interested as stockholders, and Mr. Reynolds was a director.

11 Q. Were you present at Sutherland Falls during the testing of that machine at any time or times?

A. I was present there nearly all the time of the trial.

89 12 Q. Did you see Reynolds and Severance or either of them during that trial?

A. I saw Mr. Reynolds there, and I think Mr. Severance also; Mr. Reynolds lived at Rutland, about six miles from the quarry; Mr. Reynolds was at the office of the quarry almost every day; his business was right there.

13 Q. How long did you continue the trial of that machine at that quarry with the Leschot drill head or heads?

A. Until we were satisfied it would not work, which was after some two or three weeks.

This machine of ours was a six-spindle drill; it formed a channel in the rock by cutting a series of holes in line, nearly two inches in diameter each, which so nearly intercommunicated as to readily allow an open cut to be made by chipping out or breaking away between the holes. The spindles were hollow, and the apertures conformed very nearly to the size of the hole in the head. In cutting, a core was allowed to pass through the head and up the spindle, leaving in the rock a small annular hole about the cores in the bed of the rock.

Our theory was that in operating the cores could be readily detached from the holes and the spindles after having been cut, and we expected to save power by allowing part of the rock to remain uncut. In practice the spindles were not long enough to admit the entire core, owing to the breaking of the cores in the passage down of the drills and the consequent greater length of the detached pieces than when in a solid core. This necessitated emptying the spindles of the cores before the entire depth of hole had been reached, which could only be done with the greatest difficulty, as it was necessary to run the machine back where the cores could be dropped out. Moreover, we found that the increased friction of the core, combined with the outside of the hole, required an excessive amount of power; it was entirely impracticable, therefore, to use that drill in our machine.

14 Q. What did you then do in respect to drill heads?

A. We adopted the solid head drill bit patented by Grier & Boyd, which we own by assignment.

90 15 Q. Can you state about what time you adopted that drill head, at Sutherland Falls, in that machine?

A. November, 1868.

16 Q. State whether or not that was with the knowledge of Reynolds and Severance.

A. It was. Our failure to make it (the Leschot drill bit) work in that machine at the time was the subject of frequent conversations between us.

17 Q. Please state whether or not the drill head you then used was similar to Complainant's Exhibit No. 2, March 25, 1873.

A. It was similar, the sapphires in this head being replaced by diamonds in ours.

18 Q. What claim, if any, did Reynolds and Severance then make to this form of drill head like Exhibit No. 2?

A. None, that I remember.

19 Q. How long did you continue to use drill heads like that of Exhibit No. 2 in that quarry?

A. Have used them continuously since that time, and are using them now.

20 Q. Did you have—if any, what—interviews subsequent with Reynolds and Severance in regard to the inventions claimed by your company on your part and by their company on their part?

A. Two interviews that I particularly remember.

21 Q. State how they were brought about.

A. They were brought about by a desire which they expressed to combine the business of rock cutting in connection with the two drills.

22 Q. Where and about when was the first of those two interviews?

A. At Middlebury, Vermont, early in '69, I think, where Mr. Severance resided.

23 Q. Who went with you?

A. Mr. James P. Upham, now present. Mr. Reynolds was also present.

24 Q. At whose request, if of any one, did you go there?

A. We had agreed to meet, I think, at their solicitation.

91 25 Q. Now, will you state what took place at that time, as near as you can?

A. I will state generally that we talked of the proposed consolidation of the interests. They thought that their drill using the Leschot bit was well adapted to mining, testing, and for other purposes where a single bit could be used, wherein the difficulties experienced in our channelling experiments would not be encountered in opening new quarries. For instance, the core taken out by the use of their bit would indicate the character of the deposit, while for channelling I think they accepted our experiments as final, as conclusive, showing its inadaptability. The conversation was more particularly concerning a division of territory, and it was suggested that one branch of the business might be given to each, such as by cutting by a series of holes to one party and cutting by a single hole to the other, as well as a general combination of interests. I think it was admitted that there would be no conflict as regards the different bit patents. We held, during this interview, that our machine was equally good for all purposes, whether testing or channelling or driving tunnels, and we were unable to agree on any basis of an arrangement, such as had been sought to be made.

26 Q. About how long after was the second interview? And state when that took place, and at whose solicitation.

A. I think during the following summer, at Bellows Falls, at the Island House. Mr. Severance telegraphed us to meet him and Mr. Holt there. Mr. Upham and myself went down. We dicussed, according to my recollection, again the question of combining the patents and business. Mr. Severance had taken out more patents on the Leschot bit, and claimed that he could make us a great deal of trouble in the use of our bit. He claimed to have practically covered up the solid head drill by a reissue of the old Leschot patent. He referred to a clause in the specification of the reissue wherein the main feature of the Leschot drill head, being its annular character, had been amended to mean also a provision for the insertion of a solid plug of steel, which made it practically a solid head.
92 We did not admit the validity of the claim in this respect, and no arrangement was finally made. Other points—there were other new claims in this reissue, whereby he had attempted to restrict us in the use of our solid head drill, such as the water for cleaning out the detritus, and, I think, other minor points.

(Counsel for defendant now offers in evidence a Patent Office copy of the Leschot reissue, February 16, 1869, specifications and drawing, being the first reissue of that patent, and the same are marked Defendant's Exhibits 52 and 53, January 28, 1874, E. G. T., Ex'r.)

27 Q. Please state whether or not that was the first notice they gave you of their claim to the solid head under the Leschot patent.

A. I think it was the first.

28 Q. Do you remember as to any other machine that was mentioned on their part as an inducement (as for channelling) for a combination?

A. I recollect they professed to have in construction a channelling machine or machines using their drill bit. I think they had or claimed to have such a machine in construction or finished in Boston.

29 Q. Why did they speak of that?

A. That was part of the inducement presented on their part for us to combine. A great deal was said by them about giving to them one part of the quarrying business, such as either channelling or gadding, and we taking the other.

30 Q. What was the result?

A. Nothing was agreed upon. We stated to them in substance that any such arrangement would enlarge their privileges and restrict ours; and, unless they could provide a large money capital that might enable the entire business of cutting rock by the use of a diamond drill to be controlled by one corporation, it would be no object for us to combine with them. Their main argument was threats, as before indicated.

31 Q. That was the last personal interview?

A. Yes.

93 32 Q. How did you hear from them next?

A. Through our customers, who notified us that claims had been made by Severance and Holt for damages.

33 Q. State, if you know, what form of notice was given to your customers.

A. A circular was received by our customers containing the advertisement of Severance & Holt. The specification of the first reissue, which had been surrendered by them, was printed in the circular in full. It was in full, together with the claims of their second reissue. The specification of the first reissue contained the reference to the "plug" before referred to, and in connection with the claims of the last reissue, the specification of which had been amended by dropping out the said reference, seemed to cover substantially the solid head drill.

34 Q. Did you have a copy of the circular so sent; if so, what has become of it?

A. We had such a copy, but have been unable to find it.

35 Q. State, if you remember, whether such circular called special attention to the claims in the last reissue.

A. I don't remember precisely the terms used, but the object of the circular was to convey the impression that our machine was an infringement of their patent.

36 Q. Are you familiar with the original Leschot invention and the specification and the claim thereof?

(Objected to.)

A. I am.

37 Q. Please state what it is.

(Objected to.)

A. It consists in arming a metallic ring or tube with diamonds, so as to form, in operating in rock or other hard substances, an annular groove, which, produced, forms an annular hole about the core.

38 Q. What, if anything, else does it claim?

(Objected to.)

A. Nothing else.

94 39 Q. Please state whether it claims a hollow tube or boring bar otherwise than in combination with an annual crown.

A. It does not.

40 Q. Please look at the two exhibits—Complainant's Exhibit No. 2 and Defendant's Exhibit No. 50—and state the points of similarity as drill bits and the points of difference.

A. Defendant's Exhibit No. 50 represents such a tool as has been described, consisting of a section of tube, one end of which is so set or armed with cutting points as will enable the tool, when revolved and progressed, to form in the rock an annular groove. The cutting points are so arranged about the face and sides of the end of the tube as to form a clearance during the progress of cutting, such clearance being necessary from the very nature of the tool. The projection, inwardly and outwardly, is somewhat less than the cutters designed to form the bottom of the annular groove. Complainant's Exhibit No. 2 represents what is known as a solid head drill. It is cone-shaped on the end and armed with cutting points so arranged as to remove all the substance cut. The center diamonds have a notch which would tend to keep the drill straight in operating by admitting constantly a small inverted cone at the central point of the drill, which is worn away by the center stones in their progress down. Upon the periphery of the face of the drill the diamonds extend slightly beyond the corner so as to produce the necessary clearance. Two small apertures admit the flow of water from the center of the drill head, evidently for the purpose of washing away the detritus. The bit itself is designed to be screwed or otherwise attached to a boring bar if holes of any depth are desired to be made. The resemblance between the two bits—Defendant's Exhibit No. 50 and Complainant's Exhibit No. 2—is scarcely more than that both use diamonds or carbon as cutting points to produce a similar result. The differences especially notable is the core produced in operating Defendant's Exhibit No. 50; in the entire hole being bored clean
by Complainant's Exhibit No. 2. They both alike provide
95 by the arrangement of the carbon points for clearance, but in
the one instance, that of Defendant's Exhibit No. 50, this clearance must be made both inwardly and outwardly, which would tend to increase the friction produced by contact with the medium cut.

41 Q. Please state what of invention is shown in the Leschot

specification and model and drawing which appears in Complainant's Exhibit No. 2.

A. Nothing.

42 Q. Are you familiar with boring tools?

A. I am somewhat so.

43 Q. What, if any, characteristic have boring tools with reference to a circumferential clearance?

A. There must always be provision for clearance and always has been.

44 Q. How is that provided for?

A. By giving the tool some point of greatest diameter, which point shall form a clearance for the tool itself.

45 Q. Will you please state which of the two forms of drill head before you—Complainant's Exhibit No. 2 and Defendant's Exhibit No. 50—of the same diameter will require the most power?

A. We find the solid head form to require less power of the diameters that we have used—that is, of about two inches.

46 Q. Materially less?

A. In a six-spindle drill, yes.

47 Q. How with regard to the speed of its working or boring; what difference, if any?

A. In the core drill, on the occasions when we experimented with it, we found that much speed increased the breakages in the core, which impeded the water and otherwise made difficulty. We can, therefore, bore more expeditiously with the solid head.

48 Q. How do they compare as to the wear of the heads?

A. I don't know that there is much difference.

96 (Counsel for complainant objects to all the foregoing questions which relate to conversations between the witness and the parties referred to in his answers.)

The further examination of the witness is adjourned till January 29, 1874, at 11 a. m.

New York, *January* 29, 1874—11 a. m.

Present: Counsel for both parties.

And the witness, Roger W. Love, being cross-examined by Mr. Blake, says:

49 X Q. Before you were the treasurer of the defendant's company what was your business?

A. I had no particular business. I was engaged immediately previously in getting up the machinery for this work.

50 X Q. Are you a mechanic?

A. Not more so than familiarity with machinery, theoretically, in general.

51 X Q. How did you acquire this familiarity, and what experience have you had in manufacturing and operating machines?

A. I was connected with a business originally where the manufacture of tools generally was carried on, and for the last 10 years I have been more or less connected with the manufacture of tools and machinery.

52 X Q. Do you mean to be understood as testifying that a bit constructed like Exhibit No. 50, of January 28, 1874, if properly mounted, provided with a hollow boring rod and a proper feed mechanism, would not successfully bore into marble and other stones?

A. No, sir; I do not mean to be so understood.

53 X Q. Was your objection to such a bit as stated in your testimony confined to its use in the channelling machines in which you used it?

A. Some of the objections would hold against its use either singly or otherwise.

54 X Q. Specify the objections you refer to in you last answer.

97 A. Increased friction; difficulty with the cores when drilling fast; difficulty arising out of the necessity of having two sets of clearers operating in a confined space, like a groove, instead of a hole, are objections which are common to both uses.

55 X Q. What do you mean by two sets of clearers?

A. Cutting against the core and cutting against the outside of the hole.

56 X Q. Do you not deem a hollow boring rod essential to the practical operation of the machines made by your company?

A. We have always used the hollow rod for conveying water to the bit; and whether it is essential, not having experimented with anything else, I cannot say.

And, being further examined by Mr. Rice, says:

57 Re-D. Q. Do you know, personally, Mr. A. J. Severance?

A. I do; since '67 I have known him.

58 Re-D. Q. State whether you corresponded with him and are familiar with his handwriting.

A. I have, and I am.

59 Re-D. Q. What is the paper now shown you, dated December 7th, 1868?

A. It is a letter from Mr. A. J. Severance, written by himself.

(Letter offered in evidence and marked Defendant's Exhibit No. 54, January 29th, 1874, E. G. T., Ex.)

(Objected to by Mr. Blake as immaterial.)

60 Re-D. Q. What was the machine referred to in that letter?

(Same objection.)

A. Our first machine, the six-spindle drill, which was at the Sutherland Falls quarry two months in the fall of '68.

98 61 Re-D. Q. What form of a cutter is there referred to which you were then using?

(Same objection.)

A. A solid head, like Plaintiff's Exhibit No. 2.

And, being further cross-examined by Mr. Blake, says:

62 X Q. How many different kinds of diamond drilling machines has your company been manufacturing since you have been treasurer?

A. Four classes of machines, comprising channelling, gadding, and excavating and splitting, and modifications of each of these.

63 X Q. Do you use in all these machines bits armed with diamonds substantially like and as shown in Complainant's Exhibit 2?

A. Like, except as to diameter.

64 X Q. And each of these bits is attached to a hollow boaring bar, is it not?

A. No, sir; it is attached to a bar with a hole through it longitudinally?

65 X Q. And, in operating these tools, a stream of water is forced through the hollow bar, is it not?

A. Yes, sir; it is.

And, being further examined by Mr. Rice, says:

66 Re-D. Q. Please state what you mean as to the form of your boaring bar.

A. I mean a tube, the longitudinal channel being only large enough to admit the flow of a small stream of water.

ROGER W. LOVE.

Sworn and subscribed this 29th day of January, 1874.

E. G. THOMPSON, *Examiner.*

99 James P. Upham, a witness produced on the part of the defendant, being first duly sworn, in answer to interrogatories propounded by Mr. Rice deposes and says:

1 Q. What is your name, age, residence, and occupation?

A. James P. Upham; I am 45 years of age; Claremont, New Hampshire; I am the president of the Sullivan Machine Co.

2 Q. How long have you been connected with business appertaining to machinery?

A. Twenty-three years.

3 Q. How long have you been familiar with machines and tools for rock drilling or boring?

A. For the past four or five years.

4 Q. When was your attention called—about when—if called at all, to the Leschot boring tool?

A. During the season of 1868.

5 Q. Who manufactured the first six-spindle machine testified to by Mr. Love?

A. It was manufactured at my establishment, at Claremont, New Hampshire; it was before the organization of the Sullivan Machine Co., and at the works now owned by that company.

6 Q. Please state whether you know A. J. Severance and John B. Reynolds, referred to; and, if so, how long have you known them?

A. I have known them since 1868.

7 Q. The first bits that were used at Sutherland Falls—do you know who made them, in the Leschot form?

A.. They were made at my works, at Claremont.

8 Q. State whether you were at Sutherland Falls during the testing of that machine.

A. I was.

9 Q. At the time you were there what form of drill bit was in use during that test?

A. At first they used the Leschot bit; afterwards the solid head.

10 Q. Where were the solid head bits made that were first used on that machine?

A. Claremont, New Hampshire; at the same shop as the
100 others.

12 Q. You may state what, if any, interviews you had with Messrs. Severance and Reynolds in regard to the use by them of your inventions or by you of their inventions.

A. I remember two interviews—one at Middlebury, Vermont, during the winter of '68–'69, with Mr. Severance and Reynolds; and the second one was at Bellows Falls, in the summer of 1869, with Mr. Severance and Mr. Holt.

13 Q. State how the interview at Middlebury was brought about.

A. It was brought about by solicitation of Reynolds and Severance.

14 Q. State, to the best of your recollection, what took place at that interview.

A. There was a wish expressed on the part of Reynolds and Severance to combine the annular drill and the machines working the same with our drill and our machines working the same. They proposed a combination with us, either of the whole business together or by dividing the kind of work to be done by the drills, they to have one class of work and we the other. The matter was talked up fully. After a long discussion we could not agree either upon terms of combination or a division of the business.

15 Q What drill bit at the time of that interview was in use on your machine?

A. Our drill bit—a solid head.

16 Q. What, if any, claim was then made by Severance & Holt to that form of bit?

A. None, that I remember.

17 Q. What, at that time, if any, claim did they make to any device that you were then using?

A. I think they talked of the control of the right of using water through a drill; nothing else that I remember at that interview.

18 Q. Please state what took place at the second interview at Bellows Falls, and state how that was brought about.

A. We received a notice from Mr. Severance or Reynolds
101 to meet them, with Mr. Holt, at the Island House, Bellows
Falls. My impression is that it was in August, 1869. Mr. Love and myself went to meet them according to appointment. Mr. Severance and Holt there proposed again the same plan of combination or division as was previously proposed at Middlebury. They

then claimed to control our drill by means of some reissues of the Leschot patent which they had procured, I think; also to interfere with the channelling business by means of machinery which they represented was in process of construction at Boston, and on this account urged a combination or, in place of that, a division of the business, as before stated. We talked the matter up fully, did not allow their claims, and finally separated without accomplishing anything.

19 Q. What notice before had you had of their claim to the solid head under the Leschot patent?

A. I don't recollect any.

20 Q. How long have you been familiar with boring tools, if at all?

A. Have been familiar all my life, particularly for twenty years past.

21 Q. What characteristics, you may state, have all boring tools?

A. They have to be so constructed that their largest diameter exceeds the diameter of the shank to which they are connected, so as give room to the borings to work out, or some other arrangement to be provided for this purpose, and are provided with cutting points or edges extending to this largest diameter.

22 Q. What is the necessity of having the cutters extend to the largest diameter of the bit?

A. The tools would not work without it, as it is necessary to give space for the cuttings to be carried up out of the substance cut; otherwise the tool would be choked.

Cross-examination waived.

JAMES P. UPHAM.

Subscribed and sworn to this 29th day of January, 1874.
E. G. THOMPSON, *Examiner*.

102 (Counsel for defendant offers in evidence certified copy of file wrapper and contents in the matter of the first reissue of letters patent granted A. J. Severance, assignee of R. Leschot, dated Feb. 16, 1869, No. 3304, and the same is marked Def't's Exhibit No. 55, Jan'y 29, 1874, E. G. T., Ex'r.)

(Also certified copy of the file wrapper and contents in the matter of the second reissue of the same patent, dated October 26, 1869, No. 3690, and the same is marked Def't's Exh. No. 56, Jan'y 29, 1874, E. G. T., Ex'r.)

Examination adjourned, by consent of counsel, to new notice.

DEFENDANT'S EXHIBIT A. March 26, 1878. E. G. T., E'r.

U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters patent granted Rodolphe Leschot, dated July 14th, 1863, No. 39235, for "tool for boring rock."

In testimony whereof I, Samuel A. Duncan, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this first day of December, in the year of our Lord one thousand eight hundred and seventy, and of the Independence of the United States the ninety-fifth.

[L. S.] SAM'L A. DUNCAN,
Acting Commissioner.

103 The United States of America to all whom these letters patent shall come:

Whereas Rodolphe Leschot, of Paris, France, has alleged that he has invented a new and useful tool for boring rock, which he states has not been known or used before his application; has made oath that he is a citizen of the Republic of Geneva; that he does verily believe that he is the original and first inventor or discoverer of the said invention, and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the Treasury of the United States the sum of thirty-five dollars, and presented a petition to the Commissioner of Patents signifying a desire of obtaining an exclusive property in the said invention and praying that a patent may be granted for that purpose: These are therefore to grant, according to law, to the said Rodolphe Leschot, his heirs, administrators, or assigns, for the term of seventeen years from the fourteenth day of July, one thousand eight hundred and sixty-three, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said invention, a description whereof is given in the words of the said Rodolphe Leschot in the schedule hereunto annexed, and is made part of these presents.

In testimony whereof I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed.

Given under my hand, at the city of Washington, this fourteenth day of July, in the year of our Lord one thousand eight hundred and sixty-three, and of the Independence of the United States of America the eighty-eighth.

[L. S.] J. P. USHER,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.
D. P. HOLLOWAY,
Commissioner of Patents.

104 The schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be in known that I, Jean Rodolphe Leschot, of Paris, in the Empire of France, have invented a new and improved tool for boring and cutting rock, stone, and other hard substances; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of the tool, and

Figure 2 is a side view of the same.

Similar letters of reference indicate corresponding parts in both figures.

Heretofore the boring of rock has been generally accomplished by the use of a chisel, punch, or boring bar operated by percussion.

This invention consists in a boring tool composed of a series of diamond edges attached to an annular or tubular stock or crown of steel or other metal, to which a rotary and a direct forward motion are given, and which is thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel, which is easily detached by the subsequent operation of a gad or wedge, the quantity of matter required to be removed by such boring tool being very small in proportion to the cavity which is formed after the withdrawal of the said kernel or core. The advantage of this boring tool is that it may be operated with a small amount of power, is expeditious in its action, and its wear is almost imperceptible in operating upon the hardest substances.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawing.

A is the annular or tubular socket or crown of steel or other metal, and a a^1 a^2 are edged cutters composed of diamonds fitted and set firmly into suitable notches or mortises in the face of the crown or stock A. These diamonds are such as, from their color, are least valuable for jewelry. They are respectively so arranged in
105 the crown or stock A that the cutting edges of some project
in a forward direction from the face or front end of the said crown or stock, as illustrated by a^1 a^1, while the edges of others project outwardly from the outer periphery thereof, as illustrated by a^1 a^1, and the edges of the others project inwardly from the inner periphery, as illustrated by a^2 a^2. This crown or stock is secured by a bayonet fastening or other means to a tubular boring bar of any suitable length, whose outer diameter is not greater than that of the said crown or stock and whose inner diameter is not less than that of the said crown or stock, and this bar is arranged to form part of a machine of suitable construction or otherwise furnished with suitable mechanical appliances, according to the nature of the work to be performed, by which it has imparted to it both a rotary and a direct forward or feeding motion, whereby it is caused to cut or bore an annular groove or hole in the rock or other hard body upon which it is employed. The operation of the tool will be greatly assisted by the injection of a stream of water through the tubular boring bar and crown or stock for the purpose of washing out and carrying away the detritus which is produced and which would otherwise choke up the annular opening and impede the action of the tool. This stream may be thrown in by a pump connected by a hose with the outer or rear end of the tubular boring bar or by any other suitable and convenient means.

When the boring has been continued to a desirable depth the

bar with the attached tool are drawn out from the hole, and the cylindrical kernel or core which has been left and which, as the boring operation has proceeded, has passed through the socket or stock and into the tubular bar is broken away by driving wedges or gads into the annular hole and then pulled out, leaving a cylindrical hole of a diameter equal to the circle described by the revolution of the edges of the diamond cutters a^1 a^1. The same kind of tool made of suitable calibre may be used for the production of solid cylinders of stone or other hard substances as well as for boring,
the solid cylinder being formed in the same way as the
106 kernel or core above described with reference to the boring
operation.

What I claim as my invention, and desire to secure by letters patent, is—

The tool for boring or cutting rock or other hard substances, composed of an annular or tubular stock or crown, armed with a series of diamonds, and operating substantially as herein specified.

RODOLPHE LESCHOT.

Witnesses:
JAMES W. BROOKS.
E. SHERMAN GOULD.

Ex'd: M. P. H.

DEFENDANT'S EXHIBIT B. March 26, 1873. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of papers in the matter of interference of Hermann *vs* Gilmore.

In testimony whereof I, Samuel A. Duncan, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-ninth day of October, in the year of our Lord one thousand eight hundred and seventy, and of the Independence of the United States the ninety-fifth.

[L. S.] SAM'L A. DUNCAN,
Acting Commissioner.

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107 Copie du brevet du Sr. Herrmann (Georges), méchanicien
à Paris, Rue de Charenton 92, en date du 3 juin, 1854.

Pour des méthodes ou procédés pour tailler, tourner, planer ou façonner les pierres dures, le granit, le marbre, etc.

L'invention qui fait l'objet de ma demande a pour but de travailler, tourner, raboter, etc., les pierres dures, telles que le granit, les porphyres, les marbres, de la même manière qu'on travaille la fonte ou le fer, sur les machines à raboter, à planer, les tours, etc.

Jusqu'à ce jour on s'est servi, pour dresser et tourner ces pierres, d'un procédé de rodage avec du grès pilé. Ce travail présente l'inconvéniente d'être excessivement long et par suite très couteux; en

outre il ne donne pas des surfaces parfaitement égales, bien dressées ou bien tournées.

Pour obvier à cet inconvénient, je suis arrivé, à l'aide du diamant, et en particulier du diamant noir (diamant carbone ou carbonate), espèce de diamant très dur, moins couteux que le diamant ordinaire, je suis arrivé, dis-je, à confectioner des outils d'une grande résistance, et que l'on peut employer sur les tours, les machines à raborter, etc., de la même manière que le *fer* de ces machines, c'est à dire, l'outil qui sert a travailler la fonte ou le fer.

Je commence par casser une partie du diamant afin d'obtenir des bords angulieres, aigus; puis j'enchâsse ce diamant à l'extrémité d'une barre de laiton ou d'autre métal, ou moyen d'une envelope d'étain, de plomb, etc., soudée au laiton et sertie par dessus le diamant.

J'obtiens de la sorte un burin capable de résister à de grands efforts, et d'enlever, pour ainsi dire, des coupeaux de pierre, comme on en enlève de fonte ou de fer sur les diverses machines-outils.

108 Pour bien faire comprende mon invention, j'ai représenté dans la fig. 1 du dessin pl. 1, le support à chariot d'un tour paralelle auquel est appliqué un outil de mon système.

A désigne le support à chariot de construction ordinaire.

B la barre de laiton qui porte le diamant.

C le diamant.

L'outil se trouve représenté en grandeur d'exécution, en coupe longitudinale et en plan dans les figs. 2 et 3.

D désigne la châsse ou envelope d'étain.

E la pierre a tourner. Celle-ci, destinée à former une cylindre ou une collonne, à été prélablement dégrossie au marteau et bouchardèe, puis ou la place entre les deux pointes du tour. La pointe aigue du diament vient l'attaquer, et la marche du tour et du chariot-porte-outil, amenant la pierre à un état parfaitement cylindrique, exactement comme un cylindre de fonte.

Il est nécessaire de mouiller constament l'outil, au moyen d'un vase placé sur le chariot, et qui, muni d'un petit tube, laisse tomber de l'eau, goutte à goutte sur le diamant.

Il est facile de se rendre compte de l'application de mon système a une machine à raboter. Il suffit d'y adapter l'outil B, C ou un outil construit d'une manière analogue et l'on peut, par son moyen, dresser, raboter, planer ou équarrer les pierres dures.

Pour faire des moulures, on se sert d'un tour ordinaire, et l'on choisit le diamant avec un angle convenable, suivant l'opération qu'on a à faire.

La forme de l'outil peut du reste varier suivant le travail.

Le mouvement de la pièce a travailler, par rapport à l'outil, doit être assez rapide.

Sur le tour par examle, la colonne ou cylindre devra tourner avec une rapidité qui sera d'autant plus grande que le diamètre sera plus petit, afin que la vitesse à la cironférence soit toujours suffisante.

Pour bien faire comprendre les diverses applications dont
mon invention est susceptible, j'ai
See stip. subd. 10th. 109 représenté, dans la pl. 2, une
sérié d'outil de formes diverses et
destinés a divers usages.

Ainsi les Nos. 1, 2, et 3 représentent des outils pouvent s'adopter à des machines à percer ou perforer les pierres.

Les Nos. 4 et 5 sont des outils adaptès a des machines à raboter, ou au support a chariot d'un tour.

Les Nos. 6, 7, et 8 sont des outils établis dans des manches en bois semblables à des crochets de tourneur pour tourner a la main.

Le No. 9 est une sciote ou scie cylindrique destiné à débiter des blocs de pierres cylindriques. On peut faire de telles sciotes de tous diamètres suivant les blocs que l'on veut obtenir.

La pl. 3 fait voir l'application de cette sciote.

La machine est formée d'une manière analogue aux machines a percer. Elle se compose d'un bati portant un arbre de commande B qui met en mouvement par les roues d'angle C une tige porte-outil D.

La sciote S est montée sur cette tige de manière à suivre son mouvement de rotation, mais à glisser verticalement sur elle. Elle repose par sa partie inférieure armée d'un nombre variable de diaments, sur le bloc de pierre dure P, dans lequel elle creuse une rainure cylindrique de part en part, jusqu'à ce que le bloc détaché soit entierrement logé dans la sciote.

Enfin en revenant à la planche Q, l'outil No. 10 est formè d'une lame en fer ou en cuivre rouge, sur le champ de laquelle sont ajustés de distance en distance des grains de carbonate pour former scie et débiter les blocs dans leur longeur ou leur largeur.

RESUMÉ.

Mon invention a pour objet:

[1me.] L'application du diamant, et en particulier du diamant noir, à la confection d'outils qui permettent de tourner, raboter, etc., les pierres dures sur les machines outils ordinaires, de la même
maniere que le fer et la fonte.
110 Ce travail n'ayant pu jusqu'ici se faire que par le rodage,
mon système constitue un procédé nouveau et d'un très
grand avantage sous le point de vue de la précision et de léeconomie.

Words and sentences enclosed between rules erased in original.

2e. Le moyen que j'ai indique de fixer les grains de diamant noir dans les barres qui doivent les supporter, en les sertissant directement dans ces barres, sans employer d'étain ou autre metal analogue.

See stip. subd. 12th.

3e. Les diverses dispositions d'outils que j'ai figurées dans mes dessins ainsi que dans leurs application au tournage, ou rabotage, au perçage, au sciage, en général au travaille des pierres dures, à l'aide des machines outils employées généralément au travail des métaux, mais avec des outils en acier.

HERRMANN.

(Private mark.)

(Copie exacte.)

Certificat d'addition du 31 Mars, 1855, par Mr. Georges Herrmann, mécanicien à Paris, No. 19505, brevet principal du 3 Juin, 1854.

(Address, &c.)

Mémoire descriptif déposé à l'appui de la demande d'un certificat d'addition au brevet d'invention, de 15 ans; demandé le 3 Juin, 1854, pour des méthodes ou procédés pour tailler, tourner, planer ou façoner les pierres dures, le granit, les marbres, etc., par Mr. Hermann (Georges), ing. mécanicien, rue de Charenton 92.

Dans mon brevet primitif portant particulièrement sur l'emploi du diamant noir (diamant carbone ou carbonate) au tournage et rabotage du granit, porphyre, etc., fe faisais mention de la manière d'enchaser le diamant noir à l'extrémité d'une barre de laiton ou d'autre métal, au moyen d'une envelope d'étain, de plomb, etc., soudés, au laiton et sertie par dessus le diamant.

111 Cependant pour maintenir ce diamant d'une manière plus solide et pouvoir faire des outils appropriés à tous les genres de travaux, soit au tour à la machine à raboter, au perçage ou perforation, soit enfin à la sciote circulaire, ou à la scie horizontale; pour obtenir dis je, un tel resultat, je perce dans la barre de fer, d'acier, de cuivre rouge, soit dans la lame en fer ou le cercle en cuivre rouge de la sciote, des trous variant selon la conformation du carbonate.

Je place le carbonate directement dans ces trous et j'en rabats ou sertis les rebords tout autour, afin de maintenir le diamant en laissant dépasser la pointe suivant l'usage auquel cet outil est destinée.

Pour bien faire comprendre les diverses applications d'ont mon invention, ainsi que ce dernier perfectionment sont susceptibles, j'ai représenté, dans la planche ci-jointe, une série d'outils de formes diverses et destinés a divers usages.

Ainsi les numéros 1, 2, et 3 représentent des outils pouvant s'adapter à des machines à percer ou perforer les pierres.

Words and sentences enclosed between rules erased in original.

Les numéros 4 et 5 sont des outils adaptes à des machines à raboter, ou au support à chariot d'un tour.

Les numéros 6, 7, et 8 sont des outils établis dans des manches en bois, semblables à des crochets de tourneur à la main.

Le numéro 9 est une sciote ou scie cylindrique destinée a débiter des blocs de pierres cylindrique. On peut faire de telle sciote de tous les diamètres suivant les blocs que l'on veut obtenir.

La pl. 2 fait voir l'application de cette sciote.

La machine est formée d'une manière analogue aux machines a percer. Elle se compose d'un bâti A portant un arbre de commande B, qui met en movement, par les roues d'angle C une tige porte-outil D.

La sciote S est montée sur cette tige, de manière à suivre son mouvement de rotation, mais à glisser verticalement sur elle. Elle repose par sa partie inférieur armée d'un nombre variable de 112 diamants, sur le bloc de pierre dure P, dans lequel elle creuse une rainure cylindrique de part en part, jusqu'à ce que le bloc détaché soit entièrement logé dans la sciote.

Enfin en revenant à la planche 1re, l'outil numéro 10 est formé d'une lame en fer ou en cuivre rouge, sur le champ de laquelle sont ajustés de distance en distance, des grains de carbonate ou du bord pour former scie et débiter les blocs dans leurs longeur ou leur largeur.

Resumé.

Les perfectionnements qui font l'objet de ma demande d'un certificat d'addition à mon invention primitif consistent donc:

1re. Dans le moyen que j'ai indiqué de fixer les grains de diamants noir dans les barres qui doivent les supporter, en les sertissant directement dans ces barres, sans employer d'étain ou autre métal analogue.

2me. Dans les diverses dispositions d'outils que j'ai figurées dans mes dessins, ainsi que dans leurs applications au tournage, au rabotage, au perçage, au sciage, et en générale au travail des pierres dures à l'aide des machine-outils employées généralement au travail des métaux, mais avec des outils en acier.

Paris, le 31 Mars, 1855.

(S'g'd) HERMANN.

113 DEFENDANT'S EXHIBIT C. E. G. T., Ex'r.

(Translation)

See stip. subd. 16th. Of French specification in the application of Georges Hermann for letters patent of the United States dated 7th of October, 1868, Paris.

Copy specification of Sig. Hermann (George), mechanical engineer, of Paris, Rue de Charonton 92; dated June 3, 1854.

Methods or processes for cutting, turning, planing, or fashioning hard stones, granite, marble, etc.

By Mr. Hermann (Georges), mechanical engineer, Rue de Charenton 92, Paris.

The invention which is the object of my application has for its purpose the working, turning, slotting, etc., of hard stones, such as granite, the porphyry, marbles, in the same way in which we work cast iron or wrought iron in machines for slotting, planing lathes, etc.

Up to this time there has been used to dress and turn these stones a process of grinding (rubbing) with pounded grit stone. This work has the inconvenience of being excessively long and consequently very costly; besides, it does not give surfaces perfectly equal (uniform), well dressed, or well turned.

To obviate this inconvenience I have arrived, by means of the diamond and in particular of the black diamond (carbon diamond or carbonate)—a kind of diamond very hard, less costly than the ordinary diamond—I have arrived, I say, at the making of tools of great resistance and which can be employed in all the machines for slotting, etc., in the same way as the iron of these machines—that is to say, the tool, which serves to work the cast iron or the wrought iron.

I commenced by breaking a part (piece) of the diamond, in order to obtain angular, sharp edges; then I set (encase) the diamond at the extremity of a bar of brass or of other metal by means of an envelope of tin, of lead, etc., soldered by the brass and driven up around the diamond.

I obtain in this way a holder capable of resisting great efforts
114 and of taking off, so to speak, chips from the stone as we take
off from cast iron or wrought iron (with) in the different machine tools.

To make my invention clearly understood I have represented in

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Words and sentences enclosed between rules erased in original.

Fig. 1 of the drawing, pl. 1, the side rest of a parallel lathe to which is applied a tool of my system.

A denotes the slide rest of the ordinary construction.

B, the bar of brass which carries the diamond.

C, the diamond.

The tool is seen represented, of natural size, in longitudinal section and in plan in Figs. 2 and 3.

D denotes the case or envelope of tin.

E, the stone to be turned. This latter, intended to form a cylinder or column, has been previously reduced in size by the hammer and pounded (hammered) down; then it is placed between the two points of a lathe. The sharp point of the diamond is made to attach it, and the movement of the lathe and of the rest which carries the tool brings the stone to a perfectly cylindrical condition, exactly as a cylinder of cast iron.

It is necessary to constantly moisten the tool, by means of a vessel placed upon the rest, and which, provided with a small tube, lets the water fall, drop by drop, upon the diamond.

It is easy to comprehend the application of my system to a machine for slotting. It is sufficient to adapt to it the tool B C or a tool constructed in an analogous manner, and we can by its means dress, slot, plane, or square the hard stone

To make mouldings we use an ordinary lathe, and we choose the diamond with a proper angle, according to the operation to be performed.

The form of the tool can, moreover, vary according to the work.

The motion of the piece to be wrought, in relation to the tool, should be very rapid. Upon the lathe, for example, the column or cylinder should turn with a rapidity which should be as much greater as the diameter is smaller, in order that the velocity at the circumference should always be sufficient.

115 To clearly make known the diverse applications of which my invention is susceptible I have represented, in pl. 2, a series of tools of different forms and intended for different uses.

See stip. subd. 18th.

Thus, Nos. 1, 2, and 3 represent tools which can be adapted to machines for drilling or for perforating stones.

Nos. 4 and 5 are the tools adapted to machines for slotting or to the slide rest of a lathe.

Nos. 6, 7, and 8 are tools, fixed in handles of wood, similar to the turners' tools for turning by hand.

No. 9 is a "sciote" or cylindrical saw intended for getting out (cutting out) cylindrical blocks of stone. We can make such "sciotes" of all diameters, according to the blocks which we wish to obtain.

Words and sentences enclosed between rules erased in original.

Pl. 3 shows the application of this sciote.

The machine is formed in an analogous manner to that of machines for drilling. It is composed of a frame, A, carrying an arbor of command, B, which sets in motion, by the bevel wheel C, a rod to carry the tool D.

The "sciote" S is mounted so as to follow its motion of rotation, but to slide vertically upon it.

It rests, at its lower part, armed with a variable number of diamonds, upon the block of hard stone P, in which it excavates a cylindrical groove through and through until the detached block will lodge entirely in the "sciote."

Finally, in returning to plate 2, the tool No. 10 is formed of a blade of iron or of copper, upon the edge face of which are adjusted, at regular intervals, grains of carbonate to form a saw and cut (get out) blocks in their length or their width.

Resumé.

My invention has for its object—

1st. The application of the diamond—and, in particular, of the black diamond—to making tools which allow of turning, slotting, etc., hard stones in the ordinary machine tools in the same manner as wrought iron or cast iron.

This work not having been done up to this time, except by rubbing (grinding), my system constitutes a new process, and one of very great advantage in the point of view of precision and of economy.

116 Copy addition to patent of S'r Hermann (George), mechanical engineer, of Paris, Rue de Charenton 92, dated March 31, 1855, for method or process for cutting, turning, planing, or fashioning hard stones, granite, marbles, &c.

"*Description.*"

In my original patent, bearing particularly upon the employment of the black diamond (diamond carbon or carbonate), for turning and planing granite, porphery, &c., I made mention of the manner of setting the black diamond at the extremity of a bar of brass or of other metal by means of an envelope of tin, of lead, &c., soldered to the brass and stuck up over the diamond. Now, to hold this diamond in a more solid way and to be able to make tools fit for all sorts of work, either in the lathe or in machines for planing or boring or perforating or, in fine, for the circular sciote or the horizontal saw—to attain such a result I bore in the bar of iron or in the copper circle of the sciote holes varying according to the form of the carbon (black diamond). I place the carbon directly in these holes

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Words and sentences enclosed between rules erased in original.

and I beat over or strike up the edges all around so as to hold the diamond, leaving the point to project out according to the use for which the tool is intended.

In order to make clear the different applications to which my invention as well as the last improvement is susceptible I have shown in the drawings annexed a series of tools of various forms and
117 adapted to different uses.

Thus Nos. 1, 2, and 3 represent tools which can be adapted to machines for boring or perforating stones. Nos. 4 and 5 are tools adapted to machines for slotting or for the slide rest of a lathe. Nos. 6, 7, and 8 are tools to be fitted in handles of wood, like turners' tools, for turning by hand. No. 9 is a sciote or cylindrical saw intended for getting out cylindrical blocks of stone.

The sciote may be made of all diameters, according to the blocks desired.

Plate 2 shows the application of the sciote. The machine is made analogous to drilling machines.

It is composed of a frame, A, carrying an arbor of command, B, which moves, by the bevel wheel C, a rod which carries the tool D. The sciote S is mounted upon this rod so as to follow its movement of rotation, but so as to slide vertically upon it. It rests its lower end, armed with a variable number of diamonds, upon the block of stone P, within which it cuts a cylindrical groove through and through until the detached block will be lodged entirely within the sciote.

Finally, to return to plate I, the tool No. 10 is formed of a blade of iron or of copper, upon the edge of which are set, at equal distances, grains of carbon or of bort to form a saw to cut out blocks lengthwise or breadthwise.

Resumé.

118 The improvements which are the object of my application for a certificate of addition to my original patent consist, therefore—

1st. In the means which I have indicated for fixing the grains of black diamonds in the bars which are to support them by setting them directly within those bars without employing tin or other analogous metal.

2d. In the various arrangements of tools which I have numbered in my drawings as well as in their application to turning, to slotting, to boring, to sawing, and, in general, to working of hard stones by means of machine tools employed generally in working metals, but with tools of steel.

Paris, March 31, 1855.
(Signed) HERMANN.

See stip. subd. 19th. 119 2d. The means which I have indicated for fixing the grains of black diamond in the bars which are to support them, by setting them directly in these bars, without employing tin or other analogous metal.

3d. The various arrangements of the tools which I have figured in my drawings, as in their application to turning or slotting, to drilling, to sawing—in general, to working of hard stones by means of machine tools employed generally in working metals, but with tools of steel.

HERMANN.

Insert translation. See stip. subd. 30th; also page 15, N. H. aff'ts, Ex. B.

(Office does not certify translations.)

DEFENDANT'S EXHIBIT E. E. G. T., Ex'r.

Le Technologiste, ou Archives des Progrès de L'Industrie Française et Etrangère, * * * Rédigé par une Société de Savants, de practiciens, d'industriels, et publié sous la direction de M. F. Malepeyre, tome VIII. Huitème année * * * Paris, * * * 1847, p. 87.

(Translation.)

New System of Boring by M. Fauvelle, of Perpignan.

In 1833 I was present at the boring of an artesian well at Rivesaltes. The water had been found and poured out in abundance. They went on to the tubing, and for that they enlarged the hole of the bore from above downwards. I was struck on seeing that it was no longer necessary to lift up the borer (boring rod) to free it from the detritus (material removed), and that the water coming from the bottom carried up, in the liquid form, all the earth which the perforating tool had detached from the sides. I said then, This is a very remarkable fact and very easy to imitate. If, by means of a
hollow borer (boring rod), we inject water into the hole in
120 proportion as we descend the water in rising again will carry
away all the detritus. This is the point from which I started
to establish a new system of boring.

The apparatus, which is seen in elevation as well as in section in each one of its details in the Figs. 25, 26, 27, 28, and 29 in Pl. 86, is composed of a hollow borer (boring rod) formed of tubes screwed end to end. The lower extremity of the borer (boring rod) is armed with a perforating tool suited to the rock (formation) which is to be

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Words and sentences enclosed between rules erased in original.

attacked. The diameter of this tool is larger than the diameter of the tubes, in order to preserve around these an annular space by which the water and the detritus can rise up. The upper extremity of the same borer (rod) is in communication with a force pump by means of jointed tubes, which follow the descending movement of the borer (boring rod) for a length of several metres.

The borer (boring rod) is impressed with a motion of rotation by means of a wrench (handle), or of percussion by a windlass, with disengaging arrangement (like that of a pile-driver).

The gin and the windlass to raise, let fall, and sustain the borer (rod) do not present any peculiarity.

When we wish to cause the borer (rod) to act we always commence by setting the pump in motion. We inject to the bottom of the hole and through the interior of the borer (boring rod) a column of water, which, in rising in the annular space comprised (contained) between the borer (rod) and the sides of the hole, establishes an ascending current, which must carry off the detritus. We then cause the borer (rod) to work as an ordinary borer (rod) does, and, in proportion as a part of the earth is detached by the tool, it is instantly carried off in the ascending current.

It results, from this mode of proceeding, that the materials (detritus) excavated having been constantly carried up (off) by the water there is no longer need of raising the borer to free it from them, which is a very great saving of time. An advantage just as valuable, at the least, is that the perforating tool is never choked by the earths
(soils); that it always acts without hindrance upon the forma-
121 tion to be pierced, which diminishes by more than nine-tenths
the difficulty of boring. If we add to this that experience proves that the fallings in are nothing in the formations in which the ordinary borer (rod) always produces them; that the borer (rod) acts at 100 metres with as much ease as at 10 metres, and that this boring rod, for the very reason that it is hollow, presents more resistance to torsion than a solid boring rod of equal volume and as much resistance to traction, we have enumerated its principal advantages.

They are, moreover, proved by the boring which I have just made at Perpignan, on the "Place Saint Dominique." This boring commenced the 1st of July; was finished the 23d by the meeting of water pouring forth from a depth of 170 metres. If from these twenty-three days (of ten hours of work) we deduct three Sundays and six days' work lost there remain fourteen days' work, or one hundred and forty hours of actual work, which represents more than one metre of boring per hour. This is more than ten times the work of an ordinary boring rod.

In the system which I have just described we see that the injection of the water takes place through the interior of the boring rod. Experience has shown me that when it is necessary to encounter gravel or stones of a certain volume (size) it is much better to inject the water through the hole and to cause it to rise through the boring rod. The greater velocity which it is possible to give to the water and the more exact (precise) calibre of the interior of the tube allow of the raising up of all the bodies which are found at the bottom of the well and which the ordinary manipulation cannot attack with advantage. I have raised by this means pebbles of 6 centimetres (3 inches) in length by 3 centimetres (1½ inch) wide.

The idea of causing the water to rise through the interior of the boring rod offers an easy means of boring beneath a sheet of water projecting (rushing forth) (at the surface) without the need of a pump. It suffices to close hermetically the orifice of the well in such a way as to leave free the play of the boring rod, and so that the issuing water is always forced to seek the bottom of the
122 tube to find an issue. It carries away from there and brings up to the surface all of the detritus.

If we add to this the possibility of making of wood the hollow stalk of the boring rod and of equilibrating (balancing) it in such a way that it does not weigh more than the water in which it is to move the problem of boring to depths of 1,000 metres and more seems to be solved.

(The word "sonde," which may be translated "borer," "boring rod," or simply "rod," applies to the whole rod extending from the surface of the earth to the part to be excavated.)

Defendant's Exhibit No. 51. Jan'y 28, 1874. E. G. T., Ex'r.

Rutland, *June* 2, 1868.

Messrs. Love & Ball.

Sirs: You are at perfect liberty to build and experiment with a machine for channelling rock, using our annular drill, and we will, soon as practicable, make you terms for the further use of the drill.

Very recpectfully yours,

REYNOLDS & SEVERANCE.

123 Defendant's Exhibit No. 52. Jan'y 28, 1874. E. G. T., Ex'r.

United States Patent Office.

Asahel J. Severance, of Middlebury, Vermont, assignee, by mesne assignments, of Rodolphe Leschot.

Letters Patent No. 39235, dated July 14, 1863; reissue No. 3304, dated February 17, 1869.

Improved Rock Drill.

The schedule referred to in these letters patent and making part of the same.

Be it known that Rodolphe Leschot, of Paris, in the Empire of France, has invented a new and improved drill or tool for the boring of rocks and other hard substances; and I, Asahel J. Severance, of Middlebury, in the State of Vermont, assignee of said invention, do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view of said tool, with its hose or water pipe and pump connected therewith, but detached from the gears and rotating machinery by which the same is operated.

Figure 2 is a side view of the boring bar or tubular stock of said drill, with its crown or boring head detached.

Figure 3 is a side view of the crown or boring head; and

Figure 4 is a front view of the same.

Similar letters of reference indicate corresponding parts in all the figures.

Heretofore the boring or drilling of rocks has been generally accomplished by means of a chisel, punch, or boring bar operated by percussion.

124 This invention consists in a drill or boring tool composed of a short hollow cylinder of steel or other metal (called the crown or boring head), armed at one end with a series of cutting edges or teeth composed of diamonds or other hard substances and attached at its other end to a cylindrical boring bar, of iron or other metal, made hollow, for the purposes hereinafter set forth.

To this boring bar, with its crown or boring head attached, is imparted, by any suitable apparatus, a combined rotary and forward motion, which causes the tool to cut an annular groove or channel in the rock or other substance upon which it is employed, leaving a central core in the form of a solid cylinder, which is easily detached by the subsequent operation of a clasp spoon or gad.

While the tool is in operation a stream of water is forced through the hollow boring bar and crown into the hole which is being bored, in order to keep the tool from heating and to wash out and carry away the detritus which might otherwise impede its action.

The advantages of this tool are that it necessitates the cutting or detrition of but very little matter compared with the size of the hole produced; that it bores the hardest rocks with great rapidity; that it effectually removes from the hole which is being bored the chips or borings as fast as produced; that it affords a cheap and expeditious method of testing the character and value of mines and quarries at great depths; that it may be operated with but little power, and does not wear out by long use.

To enable others skilled in the art to make and use this invention, I will proceed to describe it with reference to the drawings.

A is the short hollow cylinder, of steel or other metal (called the crown or boring head), and $a\ a^1\ a^2$ are the cutting edges or teeth, composed of diamonds or other hard substances, set firmly into suitable notches or mortises in the face of said crown.

These diamonds are such as, from their color, are least valuable
for jewelry. They are respectively so arranged in the face
125 of said crown A that the cutting edges of some project in a
forward direction from the front end of said crown, as illustrated by *a a*, while the edges of others project outwardly from the outer periphery thereof, as illustrated by $a^1\ a^1$, and the edges of

others project inwardly from the inner periphery, as illustrated by a^2 a^2.

This crown or boring head is secured at *b* by a bayonet fastening, screw, or other suitable and convenient means to the tubular boring bar B, Figs. 1 and 2, of any suitable length, whose outer diameter is not greater than that of the said crown and whose inner diameter is not less than that of said crown, and this bar is furnished with the requisite mechanical appliances, or otherwise made to form part of a machine of suitable construction, whereby it has imparted to it both a rotary and direct forward or feeding motion, which causes its crown to bore an annular hole in the rock or other hard substance upon which it operates.

In order to prevent the tool from heating while in operation and to remove the detritus which it produces without suspending its action, a stream of water may be forcibly injected into the hole which is being bored, through the tubular boring bar and crown, by means of an ordinary force pump, E, or other apparatus, which injects the same by applying thereto a mechanical pressure.

This forcing pump or other machine for throwing in the water is connected by a hose or water pipe, C, Figs. 1 and 2, with the outer or rear end of the tubular boring bar B, as shown at D, in such a manner that the same is not twisted by the operation of said bar.

Through this hose or pipe a rapid stream of water, driven by the pump or forcing apparatus E, is supplied to the inside of the hollow drill stock B, from which it can escape only through the crown or boring head A, where it rushes out with great force, thereby keeping the same cool and effectually washing out and carrying away in its rapid flow all the chips or borings as fast as produced.

By this means I am enabled to bore a hole many hundred
126 feet deep in the solid rock in either a vertical, horizontal, or
oblique direction without experiencing any trouble or delay
on account of the accumulations of the detritus.

When the boring has been continued to a desirable depth, the boring bar, with its crown attached, is drawn out from the hole, and the cylindrical core which has been left in the hole and which, as the boring progressed, passed through the crown into the tubular bar is broken off at or near the bottom of the hole and drawn out by means of a clasp spoon or other suitable instrument, leaving a cylindrical hole of a diameter equal to that of the circle described by the revolution of the diamond cutters a^1 a^1.

If in any case it is not deemed desirable to produce the central core or cylinder in boring, a crown or boring head may be used of similar construction with the one herein described, but having the tubular opening in its cutting end closed up with a solid plug of steel or other metal, made either concave or convex in form, and having a series of cutting edges attached thereto and so arranged in the face thereof that the circles which they describe, as the tool revolves, shall overlap each other and so cut out the whole width of the hole.

This plug is perforated with small holes for the emission of the water.

The same kind of tool, made of suitable calibre, may be used for the production of solid cylindrical columns of stone, marble, &c., for architectural purposes, the columns being produced substantially in the same way with the core before mentioned.

This tool may also be used for the manufacture of hollow cylinders or tubes of stone for draining purposes, &c., of any desired length and diameter by first producing a large solid cylinder or column, as above described, and then, by the use of these tools of different sizes, boring out from this column a number of cores or solid cylinders in succession, each successive one being smaller than the preceding, and the difference in the respective diameters of which,
less the thickness of one side of the tubular boring bar, will
127 be equal to the thickness of the sides of the tubes or hollow
cylinders produced.

But it is for the mining of all kinds of ores and the opening of roads and canals through rocky countries and the drilling of submarine ledges that this tool is most valuable.

I commonly so construct these boring machines that the same small portable steam-engine which rotates the drill operates the pump also, and I am thus enabled to make them sufficiently compact to work freely, when desired, in a mining drift or tunnel three feet high, while, by means of the force pump E, I draw the water from any convenient distance through the pipe or hose F, and, if the same be scarce or difficult to obtain, as is often the case in mountain mines, I lay a spout from the surface of the hole to a small tank or cistern placed near by to convey back the water as fast as it gushes out of the hole, and so use the same water over and over again with but little loss.

I have not set forth in my drawings the mechanical apparatus by which this drill is rotated, as I do not claim any particular form of rotating machinery as part of this invention, nor have I described the construction and operation of the force pump E, since I use any of the ordinary forms of force pumps indifferently in combination with this drill, only adapting the power of the water-forcing machinery to the depth and size of the holes to be bored.

No claim is made to the use of the diamonds for fashioning stone, as set forth in the French patents of M. Hermann and Bigot Dumaine, nor do I claim the passage of water through a drill by means of a siphon, as shown in the English patent of Robert Beart, but—

What I claim as the invention of Leschot and desire to secure by letters patent is—

1. A hollow rotating rock drill composed of a tubular boring bar, B, and a cylindrical crown or boring head, A, armed with diamond or other teeth $a\ a^1\ a^2$, when said drill is used in combination with a force pump, E, and connected with rotating machinery, substantially as and for the purposes set forth.

128 2. The use of a stream of water, when it is forced through
a hollow rock drill by means of a force pump or other appa-

ratus, which operates upon the same by means of mechanical pressure, substantially as and for the purposes set forth.

ASAHEL J. SEVERANCE.

Witnesses:
W. T. HOLT.
J. V. WHITE.

DEFENDANT'S EXHIBIT NO. 54. Jan'y 29, 1874. E. G. T., Ex'r.

MIDDLEBURY, *Dec.* 7, 1868.

Mr. Love.

DEAR SIR: Yours is received. I am glad to know that you have got your diamonds. I hope your drill or cutter will prove to be of great value. I want your price for making two machines like ours for testing purposes; I mean have the man at Claremont, N. H., make them. I want the feed of the drills self-adjusting, not constant, as now; it breaks the diamond off too bad when we come to flint. We also want some small machines like Lampson's, with rotary engine, to put down in a shaft or mine & run with a flexible hose pipe running to the machine. I want several of them right away & 2 more testing machines with feed adjustable. I wish to know how soon your man can build them & how much price.

I know Lamson's drill is an infringement, for he has no right to an annular motion nor to the streams of water. The case is clear in my mind. As I have been confined to my house for 3 weeks, I have hardly seen Mr. Reynolds, & cannot fully understand the R. proposition. I will see him soon & see what it is. I am willing to come into any fair arrangement.

Yours truly, A. J. SEVERANCE.

129 DEFENDANT'S EXHIBIT NO. 55. Dec. 29, 1874. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of the file wrapper and contents in the matter of the reissue letters patent granted A. J. Severance, ass'ee by mesne assig'ts of R. Leschot, dated February 16, 1869, No. 3304, for "improved rock drill."

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this nineteenth day of January, in the year of our Lord one thousand eight hundred and seventy-four, and of the Independence of the United States the ninety-eighth.

[SEAL.] J. M. THACHER,
Acting Commissioner.

Petition.

To the Commissioner of Patents:

The petition of A. J. Severance, of the town of Middlebury, State of Vermont, respectfully represents—

A. J. Severance, Jan. 20, 1869, Boston, Mass.

25 That Rodolphe Leschot, of Paris, in the Empire of France,
did obtain letters patent of the United States for an improved
tool for boring rock, which letters patent are dated July 14th,
1863; that your petitioner, by assignments duly made and
25 executed and recorded in the Patent Office, each bearing date
25 as follows, to wit: Annular Diamond Drill Manf'g Co., by A.
Carter, pres't, and John F. Trow, treas., to petitioner, and an-
other, dated September 22d, 1868; * * * John B. Rey-
nolds to petitioner, dated December 24th, 1868; * * *
25 130 John F. Trow and Wm. E. Worthen to petitioner, dated
Jan. 2d, 1869, has become the owner of said letters patent; and your petitioner now believes that said letters patent are inoperative by reason of a defective specification, which defect has arisen from inadvertence and mistake.

He therefore prays that they may be allowed to surrender the same, and requests that new letters patent may issue to them for the same invention for the residue of the period for which the original patent was granted, under the amended specifications herewith presented, he having paid thirty dollars into the Treasury of the United States, agreeably to the act of Congress in that case made and provided; and he further prays that you will recognize T. H. Alexander as his agent in the matter to do all he could do were he personally present and acting in the premises.

ASAHEL J. SEVERANCE.

In presence—
JOSIAH C. VINTON.
HORATIO G. PARKER.

The schedule referred to in these letters patent and forming part of the same.

To all whom it may concern:

Be it known that Rudolphe Leschot, of Paris, in the Empire of France, has invented a new and improved tool for boring and cutting rock, stone, and other hard substances; and I do hereby declare that the following is a clear, full, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of the tool, and

Figure 2 is a side view of the same.

Similar letters of reference indicate corresponding parts in both figures.

Words and sentences enclosed between rules erased in original.

Heretofore the boring or drilling of rock has been generally accomplished by means of a chisel, punch, or boring bar operated
by percussion. This invention consist in a boring tool
131 composed of a short hollow cylinder of steel or other metal
(called the stock or crown), armed at one end with a series of cutting edges or teeth composed of diamonds or other hard substances and attached at its other end to a cylindrical boring bar of iron or other metal made hollow for the purposes hereinafter set forth.

To this boring bar, with its stock or crown attached, is imparted a combined rotary and forward motion, which causes the tool to cut an annular groove or channel, leaving a central core in the form of a solid cylinder, which is easily detached by the subsequent operation of a clasp spoon or gad. While the tool is in operation a stream of water is forced through the hollow boring bar and stock or crown into the hole which is being bored to keep the tool from heating and to wash away the detritus, which might otherwise impede its action.

The advantages of this tool are that it necessitates the cutting or detrition of but very little matter compared with the size of the hole produced; that it bores the hardest rock with great rapidity; that it removes from the hole which is being bored the chips or borings as fast as they are produced; that it affords a cheap and expeditious method of testing the character and value of mines and quarries at great depths; that it may be operated with but little power, and does not wear out by long use.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawing.

A is the short hollow cylinder, of steel or other metal (called the stock or crown), and a a^1 a^2 are the cutting points or teeth, composed of diamonds or other hard substances, set firmly into suitable nothes or mortises in the face of the said stock or crown A. These diamonds are such as, from their color, are least valuable for jewelry. They are, respectively, so arranged in the face of the said stock or crown A that the cutting edges of some project in a forward direction from the front end of said crown, as illustrated by a a, while the edges of others project outwardly from the outer periphery thereof, as illustrated by a^1 a^1, and the edges
of others project inwardly from the inner periphery, as
131*a* illustrated by a^2 a^2. This stock or crown is secured by a bay-
onet fastening, screw, or other means to a tubular boring bar, B (see Fig. 2), of any suitable length, whose outer diameter is not greater than that of the said crown or stock and whose inner diameter is not less than that of the said crown or stock, and this bar is furnished with the requisite mechanical appliances or made to perform part of a machine of suitable construction, according to the nature of the work to be performed, whereby it has im-

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Words and sentences enclosed between rules erased in original.

parted to it both a rotary and a direct forward or feeding motion, which causes it to cut or bore an annular groove or hole in the rock or other substance upon which it is employed. In order to prevent the tool from heating while in operation and to remove the detritus which it produces without suspending its action a stream of water may be forcibly injected into the hole which is being bored through the tubular boring bar and cutting crown. This water, flowing out of the hole at the surface of the rock or other substance operated upon outside of the boring bar and between its outer surface and the walls of the hole or cavity bored, washes out and carries away all the borings or detritus as fast as produced and prevents the same from choking up the annular groove or channel and impeding the operation of the tool.

This stream may be thrown in by a pump connected by a hose with the outer or rear end of the tubular boring bar or by any other suitable mechanical apparatus.

(Insert clause "2" of am'd't A.)

When the boring has been continued to a desirable depth the bar, with its crown or stock attached, is drawn out from the hole, and the cylindrical core which has been left in the hole and which, as the boring progressed, passed through the stock and crown into the tubular boring bar is broken off at or near the bottom of the hole and drawn out by means of a clasp spoon or other suitable instrument, leaving a cylindrical hole of a diameter equal to the circle described by the revolution of the edges of the diamond cutters a^1 *a*.

If it should be in any case desirable to draw out the said core from the hole by means of the boring bar instead of using 131*b* the gad or clasp spoon it may be accomplished by inserting inside said bar and near to the crown thereof in a proper groove or slit cut therein a spring or self-adjusting wedge, which will hold the core inside the bar when the same is drawn out of the hole, thus bringing the core with it.

The same kind of tool, made of suitable calibre, may be used for the production of solid cylindrical columns of stone or marble for architectural purposes, the columns being produced in the same way with the core before mentioned. This tool may be used for the production also of hollow cylinders or tubes of stone or other hard substance of any desired length and diameter by first producing a large solid cylinder or column, as above described, and then by the use of these tools of different sizes boring out from this column a number of cores or solid cylinders in succession, each successive one being smaller than the preceding, and the difference in the respective diameters of which, less the thickness of one side of the tubular boring bar, will be equal to the thickness of the sides of the tube or hollow cylinder produced.

When it is not desired to produce the central core or cylinder

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Words and sentences enclosed between rules erased in original.

in boring a stock or crown may be used of similar construction with the one above described, but having the circular aperture or tubular opening in its cutting end closed up with a solid plug of steel or other metal, either concave or convex in form, and having a series of cutting edges attached thereto, and being perforated with small holes for the emission of the water.

What I claim as my invention, and desire to secure by letters patent, is—

I. The hollow cylindrical drill or boring tool, operated by a combined rotary and forward motion, composed of a tubular boring bar with an annular or other shaped crown, A, armed with diamond or other teeth $a\ {}^1a\ a^2$, substantially as and for the purposes specified.

II. The injection through the tubular boring bar and
132 crown, A, into the hole which is being bored, of a continuous or intermittent stream of water, substantially as and
for the purposes set forth.

(Erase and substitute clause 1 of am'd't A.)

III. The hollow cylindrical drill or boring tool, operated by a combined rotary and forward motion, having a crown or boring head, A, armed with diamond or other teeth or cutting edges, and supplied while in operation with a stream of water passing through the inside thereof, substantially as and for the purposes specified.

ASAHEL J. SEVERANCE.

Witnesses:
W. T. HOLT.
J. V. WHITE.

Oath.

COMMONWEALTH OF MASSACHUSETTS, } ss:
Suffolk,

On this twentieth day of January, 1869, before the subscriber, a justice of the peace, personally appeared the above-named A. J. Severance and made solemn oath that he verily believes that by reason of an insufficient or defective specification the aforesaid letters patent are not fully available to him, and that the said error has arisen from inadvertence, accident, or mistake and without any fraudulent or deceptive intention, to the best of his knowledge and belief.

[5. 5. 1, 20, '69. H. G. P. 5. 5.]

HORATIO G. PARKER,
Justice of the Peace within and for said County of Suffolk.

Words and sentences enclosed between rules erased in original.

133 *Digest of Assignments of Leschot's Patent Tool for Boring Rock.*

(This was a French invention and was first patented in France.)

I. Rodolphe Leschot, the inventor, on the 27th March, 1863, assigned one-half (½) of said invention to L. Dow.

Recorded April 17, 1863, Lib. U^6, p. 396.

II. Rodolphe Leschot to L. Dow, Jan. 19th, 1863. Contract for the making and sale of said invention, and power of attorney to dispose of the inventor's remaining one-half thereof.

Recorded Dec. 10th, 1864, Lib. S^7, p. 71.

III. L. Dow to Josiah Oakes, S. M. Seeley, and W. W. Clarke, Dec. 9th, 1864—

"All the right he has or may have in the said patent," his right being one-half of the same.

Recorded Dec. 12th, 1864, Lib. U^6, p. 396.

IV. Rodolphe Leschot, by his attorney, L. Dow, to Josiah Oakes, S. M. Seeley, and W. W. Clarke, April 29th, 1865—

"All his right in said patent or any extensions or renewals."

Recorded Oct. 9th, 1865, Lib. A^8, p. 379.

V. (The entire patent was then owned by the said Oakes, Seeley, and Clarke.)

Josiah Oakes, S. M. Seeley, and W. W. Clarke to Annular Drill Company, Sept. 21st, 1865—

"All their right in said patent."

Recorded Oct. 9th, 1865, Lib. A^8, p. 379.

VI. Annular Drill Company to John F. Trow and William E. Worthen, Oct. 15th, 1866—

"All the right, title, or interest of said company in or to said patent."

Recorded.

134 VII. John F. Trow and Wm. E. Worthen to the Annular Diamond Drill Manufacturing Company, April 23, 1867—

"All their right and interest in said patent."

Recorded Nov. 25, 1867, Lib. C^{10}, p. 91.

VIII. Annular Diamond Drill Manufacturing Company to A. J. Severance and John B. Reynolds, Sept.—

"The exclusive interest in said patent in and for the six New England States and the State of New York, excepting the city of New York."

Recorded Jan. 25, 1869.

IX. John B. Reynolds to A. J. Severance, Dec. 24th, 1868—

"All his right, title, or interest in or to said patent."

Recorded Jan 25th, 1869.

X. The Annular Diamond Drill Manufacturing Company to John F. Trow and Wm. E. Worthen, Jan. 2d, 1869—

"All the right and title of said company to said patent."

Recorded Jan. 25th, 1869.

XI. John F. Trow and Wm. E. Worthen to Mr. A. J. Severance, Jan. 2d, 1869—

"All their right, title, and interest in or to said patent everywhere, and all extensions or renewals."

This assignment ratified and confirmed by the Annular Drill Company, the same mentioned in Ass. V.

Recorded Jan. 25th, 1869.

WASHINGTON, D. C., *Feb. 1st*, 1869.

To the Hon. Commissioner of Patents:

SIR: I hereby amend the specification of A. J. Severance in
135 the matter of this application for a reissue of his letters patent
for improvements in tools for boring rocks, dated July
14th, 1863, by erasing the claim and substituting in lieu thereof the
following:

Clause 1.

What is claimed as the invention of Rodolphe Leschot and which I desire to secure by letters patent is—

1st. The hollow, rotating cylindrical drill or boring tool, however operated, composed of a tubular boring bar, with an annular or other shaped crown, A, armed with diamond or other teeth a a^1 a^2, when the boring tool or drill is connected with the rotating machinery, substantially as and for the purposes specified.

2nd. The application of water for the removal of detritus, when the stream is forced through a hollow drill or drill stock by a force pump, substantially as and for the purpose set forth.

3rd. The hollow cylindrical drill or boring tool, operated by a combined rotary and forward motion, having a crown or boring head, A, armed with diamond or other teeth or cutting edges, and supplied, while in operation, with a stream of water passing through the inside thereof, substantially as and for the purposes specified.

Inserted before filing.—T. H. A.

A. J. SEVERANCE.
By T. H. ALEXANDER, *Att'y.*

Amend by inserting, on page 4, after line 22, the following:

I am enabled to bore a hole in any direction or at any
136 angle and to inject a stream of water into the same for the
purposes specified while the tool is in operation.

Clause 2.

A. J. SEVERANCE,
By T. H. ALEXANDER, *Att'y.*

Endorsed: Amendment A. Filed Feb. 1, 1869. 1907. Cancelled by amendment B.

WASHINGTON, D. C., *Feb'y* 3, 1869.

To the Hon. Commissioner of Patents:

I hereby amend the specification of A. J. Severance for the reissue of letters patent granted to R. Leschot July 14th, '63, for imp't in rock drills, by erasing all former amendments and all the specification excepting the signatures and substituting in lieu thereof the following:

Amendment " B."

The schedule referred to in these letters patent and forming part of the same.

Be it known that Rodolphe Leschot, of Paris, in the Empire of France, has invented a new and improved drill or tool for the boring of rocks and other hard substances, and I, A. J. Severance, of Middlebury, in the State of Vermont, assignee of said invention, do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings forming part of this specification, in which figure 1 is a side view of said tool, with its hose or water pipe and pump connected therewith, but detached from the gears and rotating machinery by which the same is operated. Figure 2 is a side view of the boring bar or tubular stock of said drill with its crown or boring head detached. Figure
3 is a side view of the crown or boring head, and figure 4 is
137 a front view of the same.

Similar letters of reference indicate corresponding parts in all the figures.

Heretofore the boring or drilling of rocks has been generally accomplished by means of a chisel, punch, or boring bar operated by percussion. This invention consists in a drill or boring tool composed of a short hollow cylinder of steel or other metal (called the crown or boring head) armed at one end with a series of cutting edges or teeth composed of diamonds or other hard substances and attached at its other end to a cylindrical boring bar of iron or other metal made hollow, for the purposes hereinafter set forth. To this boring bar, with its crown or boring head attached, is imparted, by any suitable apparatus, a combined rotary and forward motion, which causes the tool to cut an annular groove or channel in the rock or other substance upon which it is employed, leaving a central core in the form of a solid cylinder, which is easily detached by the subsequent operation of a clasp spoon or gad. While the tool is in operation a stream of water is forced through the hollow boring bar and crown into the hole which is being bored, in order to keep the tool from heating and to wash out and carry away the detritus which might otherwise impede its action. The advantages of this tool are that it necessitates the cutting or detrition of but very little matter compared with the size of the hole produced; that it bores the hardest rocks with great rapidity; that it effectually removes from the hole which is being bored the chips or borings as fast as produced; that it affords a cheap and expeditious method of testing the character and value of mines and quarries at great depths; that it may be operated with but little power, and does not wear out by long use.

To enable others skilled in the art to make and use this invention, I will proceed to describe it, with reference to the drawings.

A is the short hollow cylinder of steel or other metal (called the

II. The use of a stream of water when it is forced through
141 a hollow rock drill by means of a force pump or other apparatus which operates upon the same by means of mechanical pressure, subtantially as and for the purposes set forth.

ASHAEL J. SEVERANCE,
By T. H. ALEXANDER, *Attorney.*

Endorsed: Amendment B. Substitute specification. Filed Feb. 4, 1869.

This invention consists in a hollow rotating rock drill composed of a tubular boring bar and a cylindrical crown or boring head armed with diamond or other teeth when said drill is used in combination with a force pump and is connected with rotating machinery. It also consists in the use of a stream of water when it is forced through said drill by means of a force pump or other apparatus which operates upon the same by mechanical pressure.

1907.

No. 3304. Reissue. 86–76.

Asahel J. Severance, ass'ee by mesne assig'ts of Rodolphe Leschot, of Middlebury, county of ——, State of Vermont.

Tool for boring rock.

Rec'd Jan'y 25, 1869.
Petition, " " "
Affidavit, " " "
Specification, " " "
1 Drawing, " " "
Old patent, No. 39235, July 14, '63.
Cert. dep.
1 Cash, $30, Jan'y 25, 1869.
Examined, Feb'y 4, '69, Spear.
2 Issue, Grinnell, Feb. 5, '69.
142 4 Patented, July 14, 1863.
Reissued Feb. 16, 1869.

T. H. ALEXANDER, *President.*

Ex'd: A. E. B.

DEFENDANT'S EXHIBIT No. 56. Jan'y 29, 1874. E. G. T., Ex'r.

The U. S. Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of the file wrapper and contents in the matter of the reissue letters patent granted A. J. Severance, dated October 26th, 1869, No. 3690, for "improved rock drill."

In testimony whereof I, J. M. Thacher, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this sixteenth day of January, in the year of our Lord one thousand eight hundred and seventy-four, and of the Independence of the United States the ninety-eighth.

[SEAL.] J. M. THACHER,
Acting Commissioner.

To the Commissioner of Patents:

The petition of Asahel J. Severance, of Middlebury, the county of Addison and State of Vermont, respectfully represents—

That he did obtain letters patent of the United States for a reissue on letters patent of Rodolphe Leschot for improvement in rock drills, which reissue is dated Feb. 16th, 1869; that he now believes the same are inoperative and invalid by reason of a defective specification, which defect has arisen from inadvertence and mistake. He therefore prays that he may be allowed to surrender the same and request that new letters patent may issue to him for the same invention for the residue of the period for which the original patent
143 was granted, under the amended specification herewith
presented, he having paid thirty dollars into the Treasury of the United States, agreeably to the requirements of the act of Congress in that case made and provided. He further prays that you will recognize T. H. Alexander as his attorney and agent to alter and amend the specification and to receive the patent when granted and to do all he could do if he were personally present and acting in the premises.

ASAHEL J. SEVERANCE.

In presence of us—
WM. T. HOLT.
FRANK A. POLLARD.

[50. Oct. 8, 1869. 50.]

Be it known that Rodolphe Leschot, of Paris, in the Empire of France, has invented a new and improved drill or tool for the boring of rocks and other hard substances; and I, Asahel J. Severance, of Middlebury, in the State of Vermont, assignee of said invention, do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view of said tool with its hose or water pipe and pump connected therewith, but detached from the gears and rotating machinery by which the same is operated.

Figure 2 is a side view of the boring bar or tubular stock of said drill with its crown or boring head detached.

Figure 3 is a side view of the crown or boring head; and

Figure 4 is a front view of the same.

Similar letters of reference indicate corresponding parts in all the figures.

Words and sentences enclosed between rules erased in original.

Heretofore the boring or drilling of rocks has been generally accomplished by means of a chisel, punch, or boring bar operated by percussion.

143*a* This invention consists in a drill or boring tool composed of a short hollow cylinder, of steel or other metal (called the crown or boring head), equipped at one end with a series of cutting edges or teeth composed of diamonds or other hard substances, and arranged on the face and on the outer and inner periphery of said boring tool as hereinafter described, and firmly attached at its other end to a cylindrical boring bar of iron or other metal, made hollow for the purposes hereinafter set forth.

To this boring bar, with its said crown or boring head attached, is imparted, by any suitable apparatus, a combined rotary and forward motion, which causes the tool to cut an annular groove or channel in the rock or other substance upon which it is employed, leaving a central core in the form of a solid cylinder, which is easily detached by the subsequent operations of a clasp spoon or gad.

While the tool is in operation a stream of water is forced through the hollow boring bar or crown into the hole which is being bored in order to keep the tool from heating and to wash out and carry away the detritus which might otherwise impede its action.

The advantages of this tool are that it necessitates the cutting or detrition of but very little matter compared with the size of the hole produced; that it bores the hardest rocks with great rapidity; that it effectually removes from the hole which is being bored the chips or borings as fast as produced; that it affords a cheap and expeditious method of testing the character and value of mines and quarries at great depths; that it may be operated with but little power, and does not wear out by use.

To enable others skilled in the art to make and use this invention, I will proceed to describe it with reference to the drawings.

A is a short hollow *hollow* cylinder, of steel or other metal, called the crown or boring head, and *a* a^1 a^2 are the cutting edges or teeth composed of diamonds or other hard substances set firmly into suitable notches or mortises in the face of said crown.

These diamonds are such as, from their color, are least
143*b* valuable for jewelry. They are respectively so arranged in the face of said crown A that the cutting edges of some project in a forward direction from the front end of said crown, as illustrated by *a a*, while the edges of others project outwardly from the outer periphery thereof, as illustrated by a^1 a^1, and the edges of others project inwardly from the inner periphery, as illustrated by a^2 a^2. The two rows of cutting edges last mentioned are so arranged for the purpose of sufficiently enlarging the cavity around the tool as to admit the free ingress and egress of a rapid stream of water, as hereinafter set forth.

Words and sentences enclosed between rules erased in original.

This crown or boring head thus equipped is secured at *b* by a bayonet fastening, screw, or other suitable and convenient means to the tubular boring bar B, Figs. 1 and 2, of any suitable length, whose outer diameter is not greater than that of said crown [and whose inner diameter is not less than that of said crown]*, and this bar is furnished with the requisite mechanical appliances, or otherwise made to form part of a machine of suitable construction, whereby it has imparted to it both a rotary and direct forward or feeding motion, which causes its crown to bore an annular hole in the rock or other hard substance upon which it operates.

In order to prevent the tool from heating while in operation and to remove the detritus which it produces without suspending its action a stream of water is forcibly injected into the hole which is being bored through the tubular boring bar and crown by means of an ordinary force pump, E, or other apparatus which injects the same under suitable pressure.

This forcing pump or other contrivance for throwing in the water is connected by a hose or water pipe, C (Figs. 1 and 2), with the outer or rear end of the tubular boring bar B, as shown at D, in such a manner that the same is not twisted by the operation of said bar.

Through this hose or pipe a rapid stream of water, driven by the pump or forcing apparatus E, is supplied to the inside of the hollow drill stock B, from which it can escape only through the crown or boring head A, where it rushes out with great force, 143*c* thereby keeping the same cool and effectually washing out and carrying away in its rapid flow all the chips or borings as fast as produced.

By this means I am enabled to bore a hole many hundred feet deep in the solid rock in either a vertical, horizontal, or oblique direction without experiencing any trouble or delay on account of the detritus.

When the boring has been continued to a desirable depth, the boring bar, with its [crown attached, is drawn out from the hole, and the]* cylindrical core which has been left in the hole and which, as the boring progressed, passed through the crown into the tubular bar is broken off at or near the bottom of the hole and drawn out by means of a clasp spoon or other suitable instrument, leaving a cylindrical hole of a diameter equal to that of the circle described by the revolution of the diamond cutters a^1 a^1.

If, in any case, it is not deemed desirable to produce the central core or cylinder in boring, a crown or boring head may be used of similar construction with the one herein described, but having the tubular opening in its cutting end closed up with a solid plug of steel or other metal, made either concave or convex in form and having a series of cutting edges attached thereto, and so arranged in the place thereof that the circles which they describe as the tool revolves shall overlap each other and so cut out the whole width of the hole, thus leaving no core.

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* Interlined before signing.

Words and sentences enclosed between rules erased in original.

This plug or crown so constructed and equipped is perforated with small holes for the emission of the water.

The same kind of tool, made of suitable calibre, may be used for the production of solid cylindrical columns of stone, marble, &c., for architectural purposes, the columns being produced substantially in the same way with the core before mentioned.

This tool may also be used for the manufacture of hollow cylinders or tubes of stone for draining purposes, &c., of any desired length and diameter, by first producing a large solid cylinder
143d or column, as above described, and then, by the use
of these tools, of different sizes, boring out from this column a number of cores or solid cylinders in succession, each successive one being smaller than the preceding, and the differences in the respective diameters of which, less the thickness of one side of the tubular boring bar, will be equal to the thickness of the sides of the tubes or hollow cylinders produced.

But it is for mining of all kinds of ores and the opening of roads and canals through rocky countries and the drilling of submarine ledges that this tool is most valuable.

I commonly so construct these boring machines that the same small portable engine which rotates the drill operates the pump also, and I am thus enabled to make them sufficiently compact to work freely, when desired, in a mining drift or tunnel three feet high, while, by means of the force pump E, I draw the water from any convenient distance through the pipe or hose F, and if the same be scarce or difficult to obtain, as is often the case in mountain mines, I lay a spout from the surface of the hole to a small tank or cistern placed near by to convey back the water as fast as it gushes out of the hole, and so use the same water over and over again with but little loss.

I have not set forth in my drawings the mechanical apparatus by which this drill is rotated, as I do not claim any particular form of rotating machinery as part of this invention, nor have I described the construction and operation of the force pump E, since I use any of the ordinary forms of force-pumps indifferently in combination with this drill, only adapting the power of the water-forcing apparatus to the depth and size of the holes to be bored.

No claim is made to the use of diamonds for fashioning stone, as set forth in the French patents of M. Hermann and Bigot Dumaine, nor do I claim the passage of water through a drill by means of a syphon, as shown in the English patent of Robert Beart; but

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Words and sentences enclosed between rules erased in original.

What I claim as the invention of Rodolphe Leschot, and desire to secure by letters patent, is—

(Erase and insert am'd't A.)

144 1. A series of cutting edges, $a\ a^1\ a^2$, arranged in the face and upon the outer and inner peripheries, respectively, of a hollow boring head, A, and used in combination with a force pump, E, or other apparatus for supplying water thereto, substantially in the manner and for the purposes specified.

2. The hollow rotating drill rod B, in combination with a crown or boring head constructed, equipped, and operated substantially in the manner and for the purposes described.

3. The use of a stream of water, when it is forced through a hollow rock drill by means of a force pump or other apparatus which operates upon the same by mechanical pressure, substantially as and for the purposes set forth.

ASAHEL J. SEVERANCE.

Witnesses:
WM. T. HOLT.
PHIL. CHASE.

Personally appeared before me the above-named A. J. Severance and made solemn oath that he verily believes that said patent by him owned is inoperative and void by reason of defective specification, which defect has arisen through inadvertence and mistake and not from any fraud or deceptive intent, to the best of his knowledge and belief.

ASAHEL J. SEVERANCE.

[5-ct. stamp.]

COMMONWEALTH OF MASSACHUSETTS, } ss:
Suffolk,

BOSTON, *February* 11*th*, 1869.

Sworn and subscribed to before me—

ABIAH ABBOTT,
Justice of the Peace.

145 U. S. PATENT OFFICE,
WASHINGTON, D. C., *Sept.* 1*st*, 1869.

A. J. Severance, Esq., care T. H. Alexander, Esq., Washington, D. C.:

Please find below a communication from the examiner in charge of your application for reissue of reissue No. 3304, filed Aug. 6, 1869.

Very respectfully,
—— ——,
Commissioner.

Words and sentences enclosed between rules erased in original.

Examiner's Room No. 90.

In the matter above referred to the 1st clause of claim is rejected on examination as claiming an incomplete combination. The 2d, as at present advised, may be allowed, and the 3d is rejected, being anticipated in M. Fauvelle's French patent of Sept. 5th, 1845 (Brevet d'invention No. 1378, tome 6, 1851).

ELLIS SPEAR,
Examiner in Charge,
Per H. BINNEY.

To the Commissioner of Patents:

Sir: I desire to amend the case of A. J. Severance in the matter of his application for a reissue of a patent for certain imp'ts in stone-boring machines by erasing the claims and in lieu thereof substituting the following:

(*Amendment A.*)

1st. The hollow boring head (A) furnished with a series of cutting edges arranged in the face and upon the outer and inner periphery, respectively, of said head, substantially in the manner and for the purpose described.

2d. I claim providing the hollow boring head (A) with a solid plug of steel or other metal, which may be—

146 either concave or convex, when said plug is furnished with cutting edges, arranged to operate substantially in the manner and for the purpose set forth.

3rd. In combination with a crown or boring head, constructed substantially as described, I claim a hollow rotating drill rod, as and for the purpose specified.

4th. I claim forcing a stream of water through the hollow drill rod (B) when said rod is used in combination with a crown or boring head constructed and equipped substantially as described.

(Canceled by substitute amend't B.)

Respectfully, T. H. ALEXANDER,
Attorney for Severance.

Sept. 14th, 69.

U. S. Patent Office,
Washington, D. C., *Sept.* 16*th*, 1869.

A. J. Severance, Esq., care T. H. Alexander, Esq., Washington, D. C.:

Please find below a communication from the examiner in charge of your application for reissue of reissued patent No. 3304, filed Aug. 6th, 1869.

Very respectfully,

——— ———,
Commissioner.

Words and sentences enclosed between rules erased in original.

Examiner's Room No. 90.

In the matter above referred to the application has been reconsidered in connection with amendment filed Sept. 14th, 1869.

The original patent issued in 1863. In 1869 it reissued to the assignee, who now applies for a second reissue.

147 The first clause of the present claim is for the device invented by the original patentee. It was for this alone that his patent issued, and the record of his application shows that he never attempted to claim more.

The 2nd clause of this claim is for matter of which there is no suggestion in the original record, but which was interpolated into the specification of the reissued patent as matter of description, though not then actually claimed.

The 3d cause of claim is for a combination of the invention with a device in common use. It is not easy to see what additional protection this clause gives to the invention; but as the device in question, though not shown in the original drawing or model, is described in the original specification, the same indulgence may be extended to the assignee, of which the board of examiners-in-chief (in E. W. Skinner's appeal, July 15, 1868) declares that "it has long been the practice, when a truly new device was found to exist in a machine, to allow the inventor not only a claim for it by itself, but also to indulge him in claiming it in one or more arrangements, to a limited extent, provided it is all in the same patent."

The 4th clause of claim is for "forcing a stream of water through the hollow drill rod (B) when said rod is used in combination with a crown or boring head constructed and equipped substantially as described."

The original patent was for a "tool for boring rock." The inventor never attempted to claim anything more. The injection of water through a drill rod was known in his country, having been described, eighteen years before the date of his patent, in that of Fauvelle. The inventor's specification accordingly alludes to it, not as forming part of the invention, but as advantageous in assisting its operation.

The assignee, however, filed with the first application for reissue a new drawing and additions to the model, all having reference to the use of a stream of water, and in the specification of the reissued patent expanded the inventor's incidental allusion into a description of the means and mode of applying it.

148 Having thus introduced new subject-matter into the record, he claims broadly "the use of a stream of water when it is forced through a hollow rock drill by means of a force pump or other apparatus which operates upon the same by means of mechanical pressure, substantially as and for the purpose set forth."

The office having rejected this claim in his present application, as anticipated in Fauvelle's patent, he now presents it in a limited form, claiming it only in combination with the device originally patented.

Now, it is true that the inventor of a new mechanical device is entitled to claim it, not only by itself, but in combination with other and well-known devices; but it does not follow that the patentee of a mechanical device is entitled to claim it in combination with a stream of water or any other elemental power.

This clause of claim gives no additional protection to the rights of the patentee; but it may be urged that, since it could not be infringed without infringing the clause which protects the actual inventor, it does not restrain the public from anything at all, and that therefore no harm can result from its allowance; but the public cannot be required to know that in point of law this clause is mere surplusage. They have a right to be informed in the clearest language exactly what the invention is. The patentee's duty is to specify precisely his invention, and the law does not intend that he shall obscure with unnecessary descriptions *of* things which may relate to it, but are not part of it, or shall set up claims meaning less in law and useful only as scarecrows to frighten the ignorant into compliance with illegal exactions.

The 1st and 3d clauses of the amended claim are accordingly allowed. The 2d is rejected and the 4th is a second time rejected, and the applicant remitted to his right of appeal.

The office further insists that all descriptive matter not contained in the original patent be expunged from the specification.

ELLIS SPEAR,
Examiner in Charge,
Per H. BINNEY.

149 Substitute sp'n am'd't B.

SEPT. 30TH, '69.

To the Commissioner of Patents:

SIR: I desire to amend the application of A. J. Severance for a reissue by a reissue on a patent granted to R. Leschot for improvements in rock drills by cancelling the entire specifications and claims (excepting petition, oath, and signature), and in lieu thereof substituting the accompanying specification and claims.

Respectfully, T. H. ALEXANDER,
Att'y for Severance.

(Substitute sp'n am'd't B.

Be it known that Rudolphe Leschot, of Paris, in the Empire of France, has invented a new and improved drill or tool for the boring of rocks and other hard substances; and I, Asahel J. Severance, of Middlebury, in the State of Vermont, assignee of said invention, do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Insert (see am'd't D).

Figure 1 is a front view of the crown or boring head, and Fig. 2 is a side view of the same.

Figure 1 is a side view of said tool with its hose or water pipe and pump connected therewith, but detached from the gears and rotating machinery by which the same is operated.

Figure 2 is a side view of the boring bar or tubular stock of said drill with its crown or boring head detached.

Erase (see am'd't D).

Figure 3 is a side view of the crown or boring head, and
Figure 4 is a front view of the same.
150 Similar letters of reference indicate corresponding parts in the figures.

Heretofore the boring or drilling of rocks has been generally accomplished by means of a chisel, punch, or boring bar operated by percussion.

This invention consists in a boring tool composed of a series of diamond edges attached to an annular or tubular stock or crown of steel or other metal, to which a rotary and a direct forward motion are given, and which is thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel, which is easily detached by the subsequent operation of a gad or wedge.

Insert amendment C.

The quantity of matter required to be removed by such boring tool is very small in proportion to the cavity which is formed after the withdrawal of the said kernel or core.

The advantage of this boring tool is that it may be operated with a small amount of power, is expeditious in its action, and its wear is almost imperceptible in operating upon the hardest substances.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawings.

A is the annular or tubular socket or crown of steel or other metal; a a^1 a^2 are edged cutters composed of diamonds fitted and set firmly into suitable notches or mortises in the face of the crown or stock A. These diamonds are such as, from their color, are least valuable for jewelry. They are, respectively, so arranged in the crown or stock A that the cutting edges of some project in a forward direction from the face or front end of the said crown or stock, as illustrated by *a a*, while the edges of others project outwardly from the outward periphery thereof, as illustrated by a^1 a^1, and the edges of others project inwardly from the inner periphery, as illustrated by a^2 a^2. This crown or stock is secured by a bayonet fastening or other means to a tubular boring bar of any suitable length whose outer diameter is not greater than that of the said crown or stock and whose
151 inner diameter is not less than that of the said crown or stock,

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Words and sentences enclosed between rules erased in original.

and this bar is arranged to form part of a machine of suitable construction or otherwise furnished with suitable mechanical appliances, according to the nature of the work to be performed, by which it has imparted to it both a rotary and a direct forward or feeding motion, whereby it is caused to cut or bore an annular groove or hole in the rock or other hard body upon which it is employed. The operation of the tool will be greatly assisted by the injection of a stream of water through the tubular boring bar and crown or stock for the purpose of washing out and carrying away the detritus which is produced and which would otherwise choke up the annular opening and impede the action of the tool. This stream may be thrown in by a pump connected by a hose with the outer or rear end of the tubular boring bar or by any other suitable and convenient means. When the boring has been continued to a desirable depth the bar, with the attached tool, is drawn out from the hole and the cylindrical kernel or core which has been left and which, as the boring operation has proceeded, has passed through the socket or stock and into the tubular bar is broken away, by driving wedges or gads into the annular hole, and then pulled out, leaving a cylindrical hole of a diameter equal to the circle described by the revolution of the edges of the diamond cutters a^1 a^1. The same kind of tool, made of suitable caliber, may be used for the production of solid cylinders of stone or other hard substances, as well as for boring, the solid cylinder being formed in the same way as the kernel or core above described with reference to the boring operation.

Having thus fully described this invention, what I claim as new, and desire to secure by letters patent, is—

1. A continuously revolving and progressing boring head having projecting diamond points, in combination with a tubular boring bar, substantially as and for the purposes specified.

152 2. The row of cutting edges a^1, when attached to a revolving boring head so as to project beyond the circumference thereof, for the purposes specified.

3. In combination with a revolving and progressing boring head having cutting points projecting beyond the periphery thereof, a hollow central drill rod through which water is forced or passed.

4. A series of cutting edges, a a^1 a^2, arranged in the face and upon the outer and inner peripheries, respectively, of a tubular or annular bit or boring head, A, substantially as and for the purposes specified.

T. H. ALEXANDER,
Att'y for Severance.

Endorsed: Amendment B. Substitute sp'n. Filed Sept. 30, 1869.

U. S. PATENT OFFICE,
WASHINGTON, D. C., *Sept.* 30, 1869.

Asahel J. Severance, care T. H. Alexander, Washington, D. C.:

Please find below a communication from the examiner relating to your application for letters patent for rock drill. Reissue filed August 6, '69.

Very respectfully,
—— ——,
Commissioner.

Examiner's room No. 90.

In the matter above referred to the amendment filed Sept. 30, '69, is without the signature of the applicant and is herewith returned for the same.

ELLIS SPEAR, *Examiner.*

153 To the Commissioner of Patents.

SIR: I desire to amend the specification of A. J. Severance in the matter of his application for a reissue by inserting the following after the word "wedge" in the second line, page 2, of specification:

It also consists in the combination, with the described boring tool, of a tubular boring bar or drill rod, whereby motion is imparted to the boring head and through which a stream of water is forced, as hereinafter set forth.

Respectfully,
T. H. ALEXANDER,
Att'y for Severance.

Oct. 2d, 1869.

U. S. PATENT OFFICE,
WASHINGTON, D. C., *Oct. 4th,* 1869.

A. J. Severance, Esq., care T. H. Alexander, Esq., Washington, D. C.:

Please find below a communication from the examiner in charge of your application for reissue of reissued patent No. 3304, filed August 6th, 1869.

Very respectfully,
—— ——,
Commissioner.

Examiner's Room No. 90.

In the matter above referred to a patent may be ordered to issue on the amended specification as soon as the applicant shall have complied with office rule 63 in regard to the drawing and erased letter "B" from first clause of claim.

ELLIS SPEAR,
Examiner in Charge,
Per H. BINNEY.

154 WASHINGTON, D. C., *Oct. 6th*, 1869.

To the Commissioner of Patents.

SIR: I desire to amend the case of A. J. Severance in the matter of his application for a reissue by erasing such portions of the specification as refer to views not shown in the original drawing.

Respectfully, T. H. ALEXANDER,
Att'y for Severance.

1869.

2694. Reissue.

No. 3690. Reissue.

Ashel J. Severance, ass'ee, by mesne ass'ts, of Rodolphe Leschot, of Middlebury, county of Addison, State of Vermont.

Rock drill.

Rec'd	August	6,	1869.
Petition,	"	"	"
Affidavit,	"	9	"
Specification,	"	6	"
1. Drawing,	"	"	"

Model old pat. reissue No. 3304, July 14, 1863.
Cert. dep., —.
1. Cash, $30, Aug't 6, 1869.
Add'l fee cert., —.
" cash, —.
By —— ——.
Examined Oct. 8, '69. Spear.
2. Issue, Grinnell, Oct. 14, '69.
4. Patented July 14, 1863. Reissued Feb. 16, 1869.
And again reissued October 26, 1869.
Recorded vol. —, page —.
Circular.

T. H. ALEXANDER, *Present.*

155 1867.

1st and 3d clauses rej'd Sept. 1, '69.
2d clause of amended claim rej'd & 4th rej. 2, Sept. 16th, 1869.
L., Sept. 30th, '69.
Letter, Oct. 4th, 1869.
Ex'd: J. A. R.

DEFENDANT'S EXHIBIT No. 57. E. G. T., Ex'r.

Le Technologiste, ou Archives des Progres de L'Industrie Française et Etrangere, * * * Rédigé par une Société de Savants, de practiciens, d'industriels, et publié sous le direction de M. F. Malepeyre, tome XXIV. Vingt-quatrième anné. Paris, * * * 1863, p. 538.

(*Translation.*)

Boring of mine (blast) holes by the diamond, by M. Leschot.

It will be remembered that Mr. Hermann, the ingenious constructor of apparatus for grinding cacao and other materials—apparatus into which he has introduced numerous improvements—has been one of the first to make use of the diamonds called "natural" to work and to polish the cylinders of granite which enter into the construction of this apparatus, and that he has put to use his experience in the employment of this material to get up a monolithic monumental fountain of granite several meters in height, which has been, for its elegance and the finish of the work, the admiration of connoisseurs. An engineer (Mr. Leschot) has thought that he could profit by the hardness of these diamonds and their low price to make another application of them in the art of the miner.

156 Up to this time to cut (excavate) mine hole in rocks, which it was then wished to blast by powder, there have been used engines more or less improved, moved either by the hand of man or by steam, or yet by compressed air, but which all consist in principle in a bar of steel making (producing) by successive percussions the required holes. Now, this means, practicable in rocks of moderate hardness, while yet costing much time and money, is by no means so in hard rocks.

In the apparatus of Mr. Leschot, which is easily put in motion by a single man, the steel is replaced by the diamond. A crown of diamonds—of those diamonds too hard to be cut, of which the powder only can be used, and which are in consequence of a price relatively low—surmounts a tube which, by means of a mechanism skillfully arranged, turns and advances at the same time into the stone to be perforated. In this way the instrument only acts upon the circumference of the hole which it is intended to excavate, while in the old system we acted over all its surface. The instrument once withdrawn, it only remains to remove the little cylinder which it has detached from the stone, and which only adheres to this latter by its base, which is done with the greatest facility.

Experience has, they say, perfectly answered the expectations of the inventor. Mr. Leschot has very easily perforated (bored) in an hour in a hard stone, the granite of the pavements of Paris, a canal 1 meter 20 long, with a diameter of 47 millimeters, which is the ordinary width of mine holes. Now, by the means heretofore employed, two miners make in a day's work 27 to 70 centimetres, according to the nature of the stone. Let us note that these latter wear away the instruments by a considerable amount, while the diamonds of the new apparatus, examined by the microscope after numerous trials, have not shown the least alteration.

Now that we understand the principle which has served as a basis for the apparatus of Mr. Leschot, we will endeavor to present a detailed description of it, making use of some figures.

The apparatus to set in operation the tool is mounted upon
157 a carriage borne upon wheels or on a platform with standards

upon which are arranged the bearings which receive the arbor upon which the tool is pitted. A movement of rotation is communicated to the arbor by means of a toothed wheel which commands (gears with) a pinion fastened on the motor arbor, which receives the motion from a crank handle, a pulley, or other device.

The movement which causes the tool to advance is transmitted by a wheel upon a crank axle, which gears also with another wheel upon the arbor (axle) of the tool by the intervention of an intermediate wheel. One of the extremities of the latter arbor is [(screw)] threaded in such a way that when it turns the thread of the screw impresses upon it at the same time a movement forwards. For more convenience the carriage may roll upon rails and be stopped there during the work by grapplings fixed above, or a pincers.

According to the work which it is proposed to make it perform the perforating tool is simple (single) or multiple—that is to say, that we can adapt (fit) several of them in the same frame, where they are arranged to work at (under) all angles and in all directions—parallel, convergent, and (or) divergent.

We can communicate the motion to the machine either by hand or by steam, or any other motor.

The figures show the manner in which is produced the simultaneous motion of rotation and of advance, being confined to represent, as an example, a machine with a single perforating tool.

Fig. 27, pl. 286, section along the length of a perforating tool arranged according to this principle.

Fig. 28, transverse section.

a, tube of iron, of steel, or other metal; *b*, ring or crown, bearing upon its exterior face several cutting diamonds (diamond cutters), *c c c*. This ring may be changed—that is to say, we may remove it and substitute another for it. It is fixed upon the tube by a bayonet joint, or in any other way. This tube *a* is carried by the supports and receives a continuous motion of rotation from the transmissions or gearings, arranged as is suitable upon the motor arbor (axle). Finally, we give to it a motion of advance in proportion as the hole is deepened.

158 Fig. 29 shows an arrangement in which the tool is set upon a socket movable around a vertical standard, and is capable of being raised or lowered in order to be able to work at all heights by means of three bolts, the conical heads of which slide in a mortise or circular groove. The tool can be inclined in order to bore holes at all angles and in any direction.

The apparatus can be fixed upon this frame, which is mounted upon a carriage borne upon wheels or upon rollers, and this carriage is stopped upon the rails by grapplings or pincers (clamps) *z z*, as is seen in Fig. 30, or in any other suitable way. At each turn which the tube *a* makes the crown *c* cuts out in the rock or other material an annular opening, and there remains at the centre—that is to say, at the interior of the tube—a core, which is taken away or broken afterwards. The tube advances by an extent determined by the pitch of the screw thread which it has upon a portion of its surface and by the relative motion of the wheels.

A tube of caoutchouc (India rubber), *d*, attached to the [(screw)] threaded extremity of the tube serves to throw in water to carry off the detritus, without which the tool will pack and may be choked. The channels or passages for the water are made upon the exterior or interior faces of the ring *b* to facilitate the flow of the liquid.

Fig. 31 shows an arrangement suitable for boring holes of large diameter in any direction. The motion is communicated by a crank handle or a belt thrown upon a pulley, *e*, which, by means of gearing, causes the tool to turn. The tube *a* presents a prolongation [(screw)] threaded, which, by means of gearing, transmits the necessary motion of rotation to a pinion gearing with a rack extending over the whole of the length of a support of wood, *v*, which bears the apparatus. It is this support which receives the movement of advance, which it transmits to the tube and to the crown.

This rangement allows us to vary as we may desire the inclination of the tube.

159 DEFENDANT'S EXHIBIT No. 58. E. G. T., Ex'r.

Description des machines et procédés pour lesquels des brevets d'invention ont été pris sous le régimé de la loi du 5 Julliet, 1844, publiee par les ordres de M. le Ministre de l'Agriculture, du commerce et des travaux publics.

Tome trente-quatrieme. Paris, MDCCCLX, p. 392.

(*Translation.*)

Patent of invention for fifteen years, dated the 3d of June, 1854, to Mr. Hermann, of Paris, for a tool to cut, turn, plane, or shape hard stones, granite, marble, etc.

The invention which makes the subject of my application for a patent for fifteen years has for its purpose the working, turning, planing, etc., the hard stones, such as granite, the porphyries, the marbles, in the same way as that in which we work cast iron or wrought iron in machines for dressing, for planing lathes, etc.

Up to this time there has been used for dressing and turning these stones a process of rubbing [(down)] with pounded grit stone. This [(mode of)] work presents the inconvenience of being excessively long and, consequently, very costly, besides it does not give surfaces perfectly equal, well dressed, or well turned.

To obviate this inconvenience I have attained, by means of the diamond, and especially of the black diamond, very hard, less costly than the ordinary diamond—I have attained, I say, to the completion of tools of great resistance, and which can be used in lathes, machines for planing, etc., in the same way as [(for)] the iron of these machines—that is to say, the tool which serves to work cast or wrought iron.

I commence by breaking a portion of the diamond, in order to obtain sharp, angular edges; then I set this diamond in the end of a bar of brass or other metal by means of an envelope of tin, of lead,

&c., soldered to the brass and driven up around the diamond.

160 I obtain in this way a burin capable of resisting great strains and of taking off, so to speak, chips of stone, as we take them off of cast iron or of wrought iron by the different machine tools.

The stone to be turned and intended to form a cylinder or a column has been previously reduced by a hammer and pounded; then it is placed between the two points of the lathe. The sharp point of the diamond proceeds to attack it and the motion of the lathe and of the slide rest bearing the tool brings the stone to a perfectly cylindrical state, exactly like a cylinder of cast iron.

It is necessary to constantly moisten the tool by means of a vessel placed over the slide rest and which, furnished with a tube, lets fall the water, drop by drop, upon the diamond.

It is easy to explain the application of my system to a planing machine. It suffices to adapt it to the tool or a tool constructed in an analogous manner, and we can, by its means, dress, groove, plane, or square hard stones.

To make mouldings we make use of an ordinary lathe, and we select the diamond with a suitable angle, according to the work which is to be done.

The form of the tool can, moreover, vary according to the [(nature of the)] work.

The motion of the piece to be wrought, with reference to the tool, should be very rapid. Upon the lathe, for example, the column should turn with a rapidity which should be the greater in proportion as the diameter is smaller, in order that the velocity at the circumference may always be sufficient.

In fine, my invention has for its object the application of the diamond and, in particular, of the black diamond, to the making of tools which allow of the turning, planing, etc., of hard stones upon the ordinary machine tools in the same way as wrought iron or cast iron.

As this work could not hitherto be done but by rubbing, my system constitutes a new process and of very great advantage in the point of view of precision and of economy.

161 *Certificate of Addition. Dated the* 31*st of March*, 1855.

In my original patent bearing particularly upon the employment of the black diamond for the turning, planing (dressing) of granite, of porphyry, etc., I made mention of the manner of setting the black diamond at the extremity of a bar of brass or of other metal by means of an envelope of tin, of lead, etc., soldered to the brass and struck up over the diamond.

However, to hold this diamond in a more solid way and to be able to make tools fit for all sorts of work, either in the lathe, in the planing machines, for drilling or for boring, or, finally, for the circular "sciotte"* or for the horizontal saw, I drill in the bar of iron, of steel, of copper, or in the blade of iron or the circle of copper of the sciotte holes varying in diameter according to the conformation of the black diamond. I place the diamond directly in these holes, and I beat over or strike up the edges all around, in order to hold the diamond, leaving the point projecting beyond them according to the use for which this tool is intended.

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*(The word "sciotte" simply means a marble or stone cutter's saw, and may always be translated saw. It has no reference to any particular form.)—Note by translator.

The machine is formed as machines for drilling. It is composed of a frame carrying a "command axle" (communicating the motive power), which sets in motion by its bevel wheels a rod to carry the tool.

The "sciotte" is mounted upon this rod in such a way as to follow its motion of rotation, but to slide vertically upon it. It rests by its lower part, armed with a variable number of diamonds, upon the block of hard stone, in which it cuts out a circular groove through and through until the detached block is entirely lodged in the "sciotte."

Lastly, the tool is formed of a blade of iron or of copper, upon the edge face of which are adjusted, at regular distances, grains of diamond arranged on the edge of this blade to form a saw and cut the blocks in their length or width.

The improvements which are the objects of my application for a certificate of addition to my original patent consist, therefore—

162 1st. In the means which I have indicated of fixing the grains of black diamond in the bars which are to support them by setting them directly in these bars without employing tin or other like metal.

2d. In diverse arrangements of tools, as well in their application to turning, to planing, dressing, to boring, to sawing, and, in general, to the working of hard stones by means of machine tools used generally for working the metals with tools of steel.

163 At a stated term of the circuit court of the United States of America for the second circuit and southern district of New York, held at the city of New York on the 21st day of April, A. D. 1875.

Present: The Honorable Nathaniel Shipman, judge.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY. } In Equity.

This cause came on to be heard at this term of said court and was argued by counsel, and thereupon, and upon consideration thereof, it is found and hereby ordered, adjudged, and decreed that the reissued letters patent referred to in the complainant's said bill, granted to Asahel J. Severence, for a new and useful improved rock drill, on the 26th day of October, 1869, and numbered 3690, are good and valid, and that Rudolph Leschot, as set forth in the bill

164 herein, is the original and first inventor of the invention described and claimed in said reissued letters patent, and that the said defendants have infringed the second claim of the said re-

issued letters patent and the exclusive rights of the complainants under the same.

And it is further ordered, adjudged, and decreed that the complainants do recover of the defendants the profits, gains, and advantages which the said defendants have received or made, or which have arisen or accrued to them by reason of said infringement of the said reissued letters patent since the date thereof, as also the damages to the complainants, to be assessed as provided by statute.

And it is further ordered, adjudged, and decreed that the said complainants do recover of the defendants their costs and charges and disbursements in this suit, to be taxed.

And it is further ordered, adjudged, and decreed that it be referred to Edward G. Thompson, as special master *pro hac vice*, residing in the city of New York, to ascertain and take and state and re-
165 port to the court an account of the gains, profits, and advantages which the said defendants have received, or which have arisen or accrued to them by reason of such infringement of the said reissued letters patent, and also the damages suffered by the complainants herein since the date thereof.

And it is further ordered, adjudged, and decreed that the complainants, on such accounting, have the right to cause an examination of the said defendants *ore tenus* or otherwise, and also the production of the books, vouchers, and documents of said defendants, and that the said defendants attend for such purpose before said master from time to time as said master shall direct.

And it is also further ordered, adjudged, and decreed that a perpetual injunction be issued in this suit against the said defendants according to the prayer of said bill.

(Signed) N. SHIPMAN, *Judge.*

(Endorsed :) U. S. circuit court, southern dist. of N. Y. In equity. American Diamond Drill Company *vs.* Sullivan Machine
166 Company. Interlocutory decree. Filed April 21, 1875.

167 United States Circuit Court, Southern District of New York.
In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
ag'st
THE SULLIVAN MACHINE COMPANY.

Before the Hon. Nathaniel Shipman, judge.

APRIL 29TH, 1875.

On reading and filing the petition of the above defendants, The Sullivan Machine Company, praying for a rehearing of this cause and upon the proofs and interlocutory decree made herein and upon motion of Brainard & Rice, solicitors for the petitioners, it is ordered that the complainants show cause before this court, at a term thereof to be held at the city of New York, on the 12th day of May,
168 1875, at the room of the circuit judge, No. 41 Chambers street, at eleven o'clock in the forenoon or as soon thereafter as

counsel can be heard, why the prayer of said petition should not be granted, and that in the meantime all proceedings on the part of the complainants in this cause be stayed.

(Signed) N. SHIPMAN, *Judge.*

(Endorsed:) U. S. circuit court, so. district of New York. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Order to show cause, etc. Filed April 30, 1875.

169 *Petition.*

United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
ag'st
THE SULLIVAN MACHINE COMPANY.

To the Honorable Nathaniel Shipman, judge of said court:

The petition of the above defendants, The Sullivan Machine Company, respectfully shows—

That your petitioners find themselves much aggrieved by an interlocutory decree made in this cause by your honor on the 21st day of April instant, whereby it was, among other things, ordered, adjudged, and decreed that the defendants had infringed the second claim of the reissued letters patent granted to Ashahel J. Severance, for a new and useful improved rock drill, on the 26th
170 day of October, 1869, and numbered 3690.

And your petitioners submit that such decree is erroneous for the following reasons, to wit:

Because the said second claim as construed secures a device not new at the date of the original patent in question, of which fact there was before the court on the hearing clear and uncontradicted evidence, as follows: At page 84 of printed copy proofs, Mr. Ball, a witness, was asked to look at Exhibit "D" (Hermann's drawings) and to state what, if any, tool he found there with diamonds so arranged as to cut the material to be bored outside the circumference of the boring bar or crown. The witness answered that he found "a line, drawing No. 3, which represented a tool for boring various substances, more particularly iron or stone.

"The drawing represents a shank armed with a flat cutting point of diamond, which projects beyond the shank in each
171 way from the centre, leaving an annular space of about $\frac{1}{32}$ of an inch between the shank and the wall of the hole bored."

This testimony was not contradicted in any way. Complainant's witnesses, indeed, gave no testimony in regard to tool "No. 3" and were not questioned with regard to it. Their testimony was limited to tool "No. 9" on said drawings—the "sciotte."

But the complainant's counsel, in referring to this evidence, misapprehended or referred to it in a manner calculated to mislead the court in respect to this evidence.

For example, Mr. Blake, at the bottom of page 5 of his printed brief, commented on the evidence thus:

"Ball says (p. 84) that he finds in figure 3 of the drawing a shank armed with a flat cutting point or diamond which projects beyond the shank in each way from the centre. This, however, is manifestly not a boring tool."

On the contrary, Hermann's specification stated that Nos. 1, 2, and 3 of the drawing in question represented tools adapted 172 to machines for drilling or perforating stones (fol. 469), and there is not one word of evidence in the case to sustain Mr. Blake's assertion that the tool No. 3 was not a boring tool.

And Mr. Washburn referred to this evidence in his final brief and connected this testimony with the testimony of Mr. Ball and Mr. Renwick relating to the sciotte in such manner (see "final brief," page 13, &c.) as to convey the impression, incorrectly, that Mr. Ball and Mr. Renwick were in conflict in their testimony in respect to tool No. 3, as well as No. 9, while Mr. Renwick, in point of fact, nowhere alluded to tool No. 3.

Mr. Harding, in his argument, did not allude to the evidence relating to tool No. 3, but he assumed that Mr. Leschot was entitled as inventor to the second claim as construed.

And your petitioners further show that the said decree or order has been entered, but that final decree has not yet been entered herein.

173 Wherefore your petitioners pray that your honor will be pleased to grant a rehearing of this case, with a stay of proceedings meantime, under said decree, upon such terms as may be proper.

And your petitioners will ever pray, &c.

New York, April 27, 1875.

(S'g'd) SULLIVAN MACHINE COMPANY.

BRAINARD & RICE,
Sol'rs for Petitioners, 41 *Wall St., N. Y.*

We certify that we have examined the proofs referred to in the foregoing petition, and are of opinion that the interlocutory decree therein mentioned is erroneous, for the reasons specified in said petition.

New York, April 27, 1875.

(Signed) EDW'D M. DICKERSON,
EDWIN T. RICE,
Counsel.

(Endorsed:) U. S. circuit court, so. dist. of New York. The American Diamond Drill Company *v.* The Sullivan Machine Company. 174 Petition for a rehearing. Brainard & Rice, solicitors for defend'ts, 41 Wall St., N. Y. Filed April 30, 1875.

(Further endorsed:) Petition argued and prayer denied. New York, May —, 1875. (Signed) N. Shipman, judge.

175 United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

Please take notice that I shall move this court, on the 12th day of March, 1877, at three o'clock in the afternoon, at the court-rooms thereof, in the city of New York, for an order amending the interlocutory decree of this court entered herein on the 21st day of April, 1875, as per the accompanying petition and order. The said motion will be made upon the decision of his honor Judge Nathaniel Shipman in the case of the American Diamond Rock Boring Co. *vs.* The Sullivan Machine Company *et als.*, now pending undetermined in the United States circuit court for the second circuit and 176 southern district of New York, and on the motion for preliminary injunction therein and upon all the pleadings, proofs, and all proceedings in said suit and herein.

(S'g'd) CHARLES F. BLAKE,
Sol'r. for Complainants.

To E. T. Rice, Esq., sol'r. for defendants.

177 United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

And now come the complainants herein and move to amend the interlocutory decree entered herein on the 21st day of April, 1875, by striking out therefrom the words "the second claim" and inserting instead thereof the words "the second and third claims."

(Signed) CHARLES F. BLAKE,
Sol'r for Complainants.

On motion of Charles F. Blake, Esq., and on argument of Mr. Blake for the motion and Mr. E. T. Rice opposed, and on due consideration thereof, it appearing that upon the hearing and trial of the above-entitled cause, when said decree was entered, it was held 178 and announced by the court that the 2nd and 3rd claims of said patent had been infringed, and that a decree of infringement of said two claims might be entered, and through inadvertence of counsel a decree was drawn and signed for an infringement of the second claim, therefore it is ordered that the interlocutory decree entered herein on the 21st day of April, 1875, be, and it hereby is, amended by striking out therefrom the words "the second claim" and inserting instead thereof the words "the second and third claims."

Dated at New York this 26th day of April, 1877.

(Signed) N. SHIPMAN, *Judge.*

(Endorsed:) U. S. circuit court, southern dist. of New York. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Notice of motion to amend interlocutory decree and order amending same. Service admitted of the within notice. New York, M'ch 9th, 1877. E. T. Rice, def'ts' sol'r. U. S. circuit court. Filed Apr. 27, 1877. John I. Davenport, clerk.

179 SOUTHERN DISTRICT OF NEW YORK, *ss:*

United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

Edwin T. Rice, being duly sworn, says he is one of the solicitors for the defendant in this cause; that on April 21st, 1875, an interlocutory decree was entered herein, of which a copy is hereto annexed, marked "Exhibit 1;" that the special master therein named has become associated in business with the complainant's solicitor herein, and has not acted and declines to act as such master.

(S'g'd) EDWIN T. RICE.

Sworn before me this 21st day of February, 1877.

(S'g'd) COTTRELL T. CABERLEY,
Notary Public, Kings County.

Certificate filed in N. Y. Co.

180 Exhibit 1, being copy of interlocutory decree, filed April 21st, 1875, referring cause to E. G. Thompson, as master *pro hac vice.* (See same on page —.)

United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
ag'st
THE SULLIVAN MACHINE COMPANY.

SIR: Please take notice that upon the foregoing affidavit and upon the pleadings, proofs, and proceedings had herein a motion will be made before this court, at the equity court room
181 thereof, in the city of New York, on Monday, the 26th day of February instant, at eleven o'clock in the forenoon, or as soon thereafter as counsel can be heard, that a master be appointed herein for and in place of the master named in the interlocutory decree herein.

New York, Feb'y 21st, 1877.

(S'g'd) BRAINARD & RICE,
Def't's Sol'rs, 41 *Wall St., N. Y.*

To Charles F. Blake, Esq., complainant's solicitor.

(Endorsed:) U. S. circuit court, southern dist. of N. Y. In equity. The American Diamond Drill Company against The Sullivan Machine Company. Affidavit and notice of motion, etc. Brainard & Rice, defendant's sol'rs, 41 Wall St., N. Y.

Service admitted.
N. Y., Feb'y 21, 1877.
(Signed) CHARLES F. BLAKE,
Sol'r for Compl't.

182 U. S. Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

It is hereby stipulated that General S. A. Duncan be appointed master *pro hac vice* in place of Edward G. Thompson, Esq., under interlocutory decree entered herein February 21, 1875, and that order be so entered.

New York, Feb'y 26, 1877.
(Signed) CHARLES F. BLAKE,
Sol'r for Compl'ts.
(Signed) BRAINARD & RICE,
Sol's for Def'ts.

(Endorsed:) U. S. circuit court, southern dist. of N. Y. The American Diamond Drill Co. *vs.* The Sullivan Machine Co. 183 Motion, papers, and stipulation. Brainard & Rice, sol'rs for def't, 41 Wall St., N. Y. Filed Feb'y 27, 1877.

184 United States Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

To the Honorable Nathaniel Shipman, judge of said court:

The petition of the above defendants, The Sullivan Machine Company, respectfully shows—

That your petitioners find themselves much aggrieved by an interlocutory decree made in this cause by your honor on the 21st day of April, 1875, and duly entered, whereby it was, among other things, adjudged that your petitioners had infringed the "second" claim of the reissued letters patent granted to Asahel J. Severance, assignee, for a new and useful improved rock drill, on the 185 26th day of October, 1869, and numbered 3690, and whereby it was referred to Edward G. Thompson, as special master, to take, state, and report an account of the gains, profits, and advantages which your petitioners have received or which have arisen and accrued to your petitioners by reason of such infringement of the second claim of said reissued patent, and also the damages suffered by the complainants herein since the date thereof; which said decree was, by order made herein by your honor April 26th, 1877, and duly entered, so amended as to adjudge that your petitioners had infringed also the "third claim" of said reissued letters patent, and was further amended about the same time by the substitution in said decree of S. A. Duncan, Esquire, as special master in place of the said E. G. Thompson, Esquire.

And your petitioners further show that an accounting is now pending under said interlocutory decree, amended as above set forth, before said S. A. Duncan, Esquire, as master, but no report has yet been made to the court by said master, and no final
186 decree has been entered herein.

And your petitioners further show that under recent decisions of the Supreme Court of the United States the said decree as amended is erroneous for the following reasons, to wit:

Because the original patent of Rudolph Leschot in question by its model, drawings, and description showed an annular or bore drill or bit armed with diamonds, and the specification contained a single claim only, to wit: "The tool for boring or cutting rock or other hard substances, composed of an annular or tubular stock or crown armed with a series of diamonds and operating substantially as herein specified;" and it was in effect adjudged by said decree as amended that your petitioners had not infringed the tool described and claimed in and by said original specification and claim.

Because it appears from the record in this case that the alleged invention of Leschot was a French invention and was first patented in France, and that the original letters patent in the United
187 States of said Leschot, issued July 14, 1863, and that the said
Leschot was not a party to the applications for reissue made by Asahel J. Severance, as assignee of said Leschot patent, in the year 1869, nor was the original French patent of Leschot used or referred to for the purpose of correcting or amending the Leschot specifications and claims.

Because it appears by the record that the Leschot patent was twice reissued during the year 1869 on petition of the said Severance after machines and tools like those manufactured by your petitioners had been in use in a quarry in which the said Severance was interested and with his knowledge for several months prior to the first application for reissue made by said Severance.

Because said second and third claims were designed by said Severance to enlarge and expand the patent of Leschot so as to include drills other than annular or core drills, which, under the circumstances and facts appearing from the record, was not authorized by the United States patent law as construed by re-
188 cent decisions of the Supreme Court of the United States.

Wherefore your petitioners pray that your honor will be pleased to grant a rehearing of this cause, with a stay of proceedings meantime, under said decree upon such terms as may be proper.

And your petitioners will ever pray, &c.
New York, February 15th, 1883.
(S'g'd) SULLIVAN MACHINE COMPANY,
Per E. T. RICE, *Attorney.*

E. T. RICE,
Solicitor for Petitioners.

We certify that we have examined the record referred to in the foregoing petition and the recent decisions of the Supreme Court of the United States relating to construction of claims of reissued patents, and we are of opinion that the interlocutory decree entered in this cause is under said decisions erroneous for the reasons specified in said petition.

(Signed) EDWIN T. RICE,
ALVAN P. HYDE,
Counsel.

189 U. S. Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

Before the Hon. Nathaniel Shipman.

FEBRUARY 27TH, 1883.

On reading and filing the petition of the above defendants, The Sullivan Machine Company, praying for a rehearing of this cause, and upon the record in this cause and the interlocutory decree entered therein and orders amendatory thereof, and on motion of E. T. Rice, solicitor for the petitioners, it is ordered that the complainants show cause before me, at the United States court-room for the trial of civil causes, in the city of New York, on the 16th day of April, A. D. 1883, at 1½ o'clock p. m., or as soon thereafter as
190 counsel can be heard, why the prayer of said petition- should not be granted.

(Signed) N. SHIPMAN, *Judge.*

(Endorsed:) U. S. circuit court, southern dist. of New York. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Petition for rehearing, order, &c. E. T. Rice, sol'r for def'ts, 61 Liberty St., N. Y. Filed M'ch 21, 1883.

Service is hereby admitted of within petition and order to show cause, and for stay.
M'ch 5, '83.
(S'g'd) WETMORE, TANNER & THOMPSON,
Compl'ts' Solicitors.

191 U. S. Circuit Court, Southern District of New York. In Equity.

AMERICAN DIAMOND DRILL COMPANY
against
SULLIVAN MACHINE COMPANY.

NEW YORK, *June 19th*, 1883.

Present: The Honorable N. Shipman, judge.

An order to show cause why this cause should not be reheard having been made herein, dated February 27th, 1883, on the petition of the defendant, and an order staying proceedings before the master herein having been also made, dated March 3rd, 1883:

Now, after hearing counsel for the defendant in support of said petition to rehear and counsel for complainant in opposition thereto, it is ordered that said motion to rehear be, and the same is hereby, denied without prejudice, and that the order staying proceedings before the master be, and the same is hereby, vacated. 192

(Signed) N. SHIPMAN, *Judge.*

(Endorsed:) U. S. circuit court, southern dist. of New York. In equity. American Diamond Drill Company against Sullivan Machine Company. Order denying motion to rehear and vacating stay of proceedings. E. G. Thompson, sol. for compl't, 206 Broadway. U. S. circuit court. Filed Jun. 19, 1883. Timothy Griffith, clerk.

193 *Master's Report.*

Circuit Court of the United States, Southern District of New York. In Equity.

AMERICAN DIAMOND DRILL COMPANY
vs.
SULLIVAN MACHINE COMPANY.

To the honorable the judges of the circuit court of the United States for the southern district of New York:

The master, to whom the above-entitled suit has been referred, hereby reports as follows:

On the 3d day of July, 1883, he submitted to the counsel for the respective parties a draft of his report, as hereinafter set forth, for a statement of their objections. Thereupon written objections, with requests to find, were filed by the counsel for the parties, and subsequently counsel were heard orally upon the said objections and requests. The draft of the proposed report as thus submitted to counsel is given below, being found on pages 2 to 55 hereof. Following said draft of report, on pages 56 to 62, will be found the objections and requests of the complainants, and on pages 63 to 73 are given the objections of the defendants.

194 The suit arises under reissued letters patent No. 3690, granted to A. J. Severance, as assignee of Rudolph Leschot, October 26, 1869, for an improved rock drill.

The patent having been sustained at final hearing and the defendant corporation adjudged an infringer, the case was thereupon referred to a master of the court for an accounting. The original decree ordering the accounting, entered April 21, 1875, adjudged the defendants to have infringed the second claim of the patent only. Subsequently, viz., April 26, 1877, this interlocutory decree was amended so as to embrace both the second and the third claims. The decrees direct the master to ascertain and report to the court an account, first, of "the gains, profits, and advantages" which the defendants have received by reason of their infringement of the two claims, and, secondly, "the damages in excess of profits suffered by the complainants" by reason of such infringement.

On the 13th of August, 1875, the defendants, upon the order of the then master, furnished a statement (marked "Exhibit A, Aug. 13, 1875") purporting to show "the number of machines sold and run by them in which boring heads were used with diamond-cutting edges attached so as to project beyond the circumference of the boring head since the 26th day of October, 1869, and showing the number and size of such boring heads sold and run with each machine and the cost and price of such boring heads."

The present master was appointed by a supplemental order, dated February 27, 1877, and on the 12th of December, 1879, upon motion of complainants' counsel, an order was made requiring the
195 defendants to furnish a statement of "the number of revolving boring heads for diamond rock-drilling machines and containing diamonds projecting beyond the circumference or periphery thereof by it made and sold between the 29th day of September, 1868, and the 24th day of November, 1874, whether such boring heads were provided with a hollow central drill rod for the passage of water or not, together with the names of the persons to whom and the dates when the same were sold, the cost of the same and the amount received therefor, and also a statement of all diamond rock-drilling machines provided with boring heads in which the diamonds project beyond the circumference or periphery of the head made and sold by it between the said dates, together with names, dates, cost, and prices obtained as aforesaid; also a statement of all diamond rock-drilling machines containing a revolving boring head of the character above specified, and during the period aforesaid, either rented by the defendant to lessees or run by the defendant on contract work, together with a debit and credit account of all moneys expended and received by defendant on account of such machines, and of the names, with dates, of the persons from whom such sums, respectively, have been received."

Pursuant to this order defendants, on the 31st of January, 1880, filed with the master the statement of account marked "Exhibit B, Jan. 31, 1880." This account fails to make such subdivision of the expenditures and receipts in connection with the building and use of rock-boring machines and diamond drills therefor as the master's order intended and required. The excuse offered is that the books of the Sullivan Mechine Co. had been so kept as to make it impossible to state an itemized account showing the cost of each machine or, for that matter, the aggregate cost of the several machines made and sold.

196 The defendants, however, in presenting the account, marked "Exhibit B," claimed that the earlier statement, "Exhibit A," would show substantially the cost of all the infringing diamond boring heads and the prices received for those sold, and that "Exhibit B" was approximately a correct exhibition of the various debits and credits on account of the construction, sale, and operation of the infringing machines as called for by the above-named order, but without any distinction being drawn between the machines sold and those used, which distinction defendants consider it unnecessary to make, because, as they claim, the proper balancing of the account shows the infringing business to have resulted in a large loss.

Subsequently it was agreed between the counsel that complainants did not acquire title in the Leschot patent until June 1, 1871, and thereupon it was stipulated before the master that the accounting should be restricted to the period between the last-named date and November 24, 1874, at which date complainants parted with their title in the patent.

Complainants' counsel began the examination of defendants in regard to the statement "Exhibit B" in the month of December, 1880, and since that date a large amount of testimony has been taken on both sides. By agreement this testimony in the main was reduced to writing by a scribe employed for that purpose, being taken down in short-hand and subsequently transcribed, the parties waiving the signatures of the witnesses. In addition to the oral testimony of the witnesses there has been produced before the master the day book, the cash book, the journal, and on one occasion the ledger of the defendants, and defendants have furnished transcripts of such accounts in their ledger as complainants upon examination have specifically called for, and likewise defendants' labor and machine-shop blotters, and a large mass of bills, receipts, and
197 memoranda relating to the diamond drill business have been put in evidence. In addition to the testimony directly entitled in the suit the parties have stipulated into the case considerable portions of the evidence on the accounting in certain other suits brought by owners of the Leschot patent against customers of the Sullivan Machine Co. in the district of Vermont.

The testimony and other proceedings before the master have been paged consecutively from 1 to —, and are submitted herewith.

The Leschot patent relates to a new and improved drill or tool for boring rocks and other hard substances, and the invention is stated in the patent to "consist in a boring tool composed of a series of diamond edges attached to an annular or tubular stock or crown, of steel or other metal, to which a rotary or direct forward motion are given, and which is thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel, which is easily detached by the subsequent operation of a gad or wedge, and also in the combination, with the described boring tool, of a tubular boring bar or drill rod, whereby motion is imparted to the boring head and through which a stream of water is forced."

The tool shown and described in the patent is a simple cylindrical tube armed at its cutting end with three series or sets of diamonds, one set, marked *a a*, projecting forward from the end of the tubular crown or stock; a second set, marked a^1 a^1, projecting outwardly beyond the circumference or periphery of the cylinder, and the third set, marked a^2 a^2, projecting inwardly from the inner periphery of the tubular cylinder. The patent does not show or describe
198 an organized machine of any kind, but it provides that the
boring crown or stock is to be secured to a tubular boring bar, which bar is to be "arranged to form part of a machine of suitable construction or otherwise furnished with suitable mechanical appliances, according to the nature of the work to be performed. by which it has imparted to it both a rotary and a direct forward or feeding motion." The patent further states that "the operation of the tool will be greatly assisted by the injection of a stream of water through the tubular boring bar and crown or stock," and that "this stream of water may be thrown in by a pump connected by a hose with the outer or rear end of the tubular boring bar or by any other suitable and convenient means," the object of thus injecting water being stated to be "for the purpose of washing out and carrying away the detritus."

The second and third claims, which the court has adjudged to be infringed, are as follows:

"2. The row of cutting edges a^1 when attached to a revolving boring head so as to project beyond the circumference thereof, for the purposes specified.

"3. In combination with a revolving and progressing boring head having cutting points projecting beyond the periphery thereof, a hollow central drill rod through which the water is forced or passed."

The tool or bit made and used by the defendant corporation and held by the court to infringe these claims was not strictly an annular tool—that is, it did not cut an annular groove and leave a standing core—but the boring end of the tool was made conical and was so armed with "carbons" (diamonds) that all the rock or other material within the limits of the hole to be bored was cut away by the abrading action of hard and sharp edges upon these carbons. In this
199 tool, however, as made and used by the defendants the outer-
most carbons or diamonds were so set as to project laterally beyond the circumference of the cylindrical body of the tool, and the tool itself was attached to a boring bar from which it received a "direct" (positive) rotary progressive motion. This boring bar was made tubular, to permit the passage downward of a stream of water, which, on reaching the lower end of the bit, was delivered through openings therein into the bottom of the hole.

As used by the defendants, this boring head and drill rod formed part of an organized machine comprising an engine and boiler, a feeding and reversing mechanism, and guides and adjusting devices and various other appliances, the aggregate cost of the entire mechanism being many times that of the boring head and drill rod alone.

The defendants have made and sold during the period of the accounting three kinds of machines which embody the Leschot invention, viz., "channeling machines," provided each with two drill spindles and two bits or boring heads,* and used generally for cutting continuous channels in marble quarries for the purpose of dividing the rock up into blocks; "gadding machines," provided each with two drill spindles and used generally for cutting separate "gad holes" for the insertion of wedges for "raising" the blocks of marble, and "splitting machines," provided with three spindles and heads, and used generally for boring splitting holes in blocks of marble.

The various machines sold by the defendant corporation from June 1, 1871, to November 24, 1874, are specified in the following table, marked "Schedule A," which shows the dates of sale, the kind of machine, the purchaser, and the moneys received. The items contained in this table are taken in the main from defendants' statement, "Exhibit B," above referred to.

200

SCHEDULE A.

Machines Sold from June 1, 1871, *to Nov.* 24, 1874.

Date of sale.	Description of machine.	Purchaser.	Price paid.	Remarks.
April 30, '72	Channeler (2 spind.).	Rutland Marble Co.	$5,000 00	
Oct. 31, '72	"	" "	5,000 00	
Aug. 30, '73	"	Sherman, Adams & Williams	5,925 00	
"	"	Clement & Sons	5,403 75	
July 31, '73	"	Rutland Marble Co.	3,500 00	Without boiler.
Aug. 31, '73	"	" "	3,437 23	" "
Sept. 30, '73	"	Brandon Statuary Marble Co.		Price of machine was $5,000, but it has never been paid for.
Mar. 31, '74	"	D. L. Kent & Co	4,000 00	
April 30, '74	"	D. O. Hitner	5,000 00	Without boiler (tunnel'g).
June 30, '74	"	Sheldon & Slason	4,750 00	" " "
Sept. 30, '74	"	Alexander Maxwell	5,500 00	
		Total for channelers	$47,515 98	
Aug. 31, '71	Gadder.	J. F. & F. B. Connolly	$2,000 00	
April 30, '72	"	Parker, Gilson & Dewey	1,725 00	
"	"	R. L. McCord	1,600 00	Without boiler (excava'g).
Oct. 31, '72	"	Rutland Marble Co.	1,500 00	" " "
"	"	Sherman, Adams & Williams	1,700 00	
"	"	Conn. Lead & Spar M'n'g Co.	2,000 00	" " "
April 30, '73	2 gadders.	Rutland Marble Co.	3,000 00	
M'ch 31, '74	Gadder.	Sheldon & Slason	2,125 00	Special machine.
Aug. 31, '74	"	Central Vt. Marble Co.	1,800 00	
Sept. 30, '74	"	Alexander Maxwell	2,000 00	
Oct. 31, '74	"	Frank Gross	2,000 00	
		Total for gadders	$21,450 00	
June 30, '71	3-spind. drills.	J. F. Scanlon	$2,480 27	
April 30, '73	"	J. B. Hollister	1,000 00	Sold for $2,800, but only $1,000 paid.
		Total for 3-spind. drills	$3,480 27	
		Grand total	$72,446 25	

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* Two of these machines, used for "tunneling," had three bits each.

It thus appears, from defendants' admissions and books, that between June 1, 1871, and November 24, 1874, they sold eleven channellers, twelve gadders, and two three-spindle drills provided with boring heads or bits of the construction which the court holds to be within the Leschot patent, and also provided with tubular drill rods for operating such bits, and that they received for these machines the gross sum of seventy-two thousand four hundred and forty-six dollars and twenty-five cents ($72,446.25).

201 It also appears from the evidence adduced that at various times during the period in question defendants had in use on contract work seven other channeling machines constructed, as regards their bits and drill rods, in substantially the same manner as the channeling machines that were sold, and therefore, under the interlocutory decree of the court, employing and embodying the Leschot inventions covered by the second and third claims of the patent, and subject to the accounting. The following table, marked "Schedule B," prepared by the master from the original journal entries, shows the various quarries for which defendants did channeling from June 1, 1871, to December 31, 1874, the number of feet cut, the prices paid, and the dates, with journal references, proper deduction being afterwards made for the time subsequent to November 24, 1874, at which date the accounting closes.

SCHEDULE B.

Receipts for Cutting from June 1, 1871, to December 31, 1874.—Wheaton Marble Co.

1872	J.					
	258	Apr.	510 10-12 feet, @ 50 cts.	$255 42		
	260	May.	1,372 6-12 " "	686 25		
	261	June.	1,083 11-12 " "	541 96		
	270	July.	1,624 2-12 " "	812 08		
	275	Aug.	1,155 6-12 " "	577 75		
	280	Sept.	1,061 5-12 " "	530 70		
	286	Oct.	1,149 " "	574 50		
	294	Nov.	1,730 6-12 " "	865 25		
					$4,843 91	
	280		Deduct overcharge—½ ft., @ .50		25	
						$4,843 66

Rutland Marble Co.

1872	J.					
	242	Feb.	Cutting done as per their statement (2,102 11-12 feet, @ 50c.—estimated)			$1,051 46

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Pittsford Marble Quarry Co.

	J.							
1872	260	May.	360		feet, @ 50 cts.	$180 00		
	261	June.	908		" "	454 00		
	270	July.	800		" "	400 00		
	280	Aug.	307	6-12	" "	188 75		
	280	Sept.	804		" "	402 00		
	286	Oct.	1,051	6-12	" "	525 75		
	294	Nov.	865		" "	432 50		
	306	Dec.	192		" "	96 00		
							$2,679 00	
1873								
	335	May.	1,411	8-12	feet, @ 50 cts.	$705 83		
	339	June.	1,165		" "	582 75		
	351	July.	1,302	4-12	" "	651 16		
	361	Aug.	1,853	11-12	" "	926 96		
	365	Aug.	56	8-12	" "	28 32		
	366	Sept.	1,078		" "	539 00		
	376	Oct.	1,043	2-12	" "	521 58		
	383	Nov.	1,123	11-12	" "	561 95		
	389	Dec.	498	6-12	" "	249 25		
							4,766 80	
								$7,445 80

Sutherland Falls Marble Co.

1871							
	222	Cutting from June 30 to November 13 (2,691 1-12 feet, @ 50c.—estimated)				$1,345 53	
1872							
	261	June.	877	3-12 feet, @ 50 cts.	$438 62		
	270	July.	1,243	2-12 " "	621 58		
	274	Aug.	2,960	8-12 " "	1,480 33		
	281	Sept.	1,488	6-12 " "	744 25		
	286	Oct.	961	6-12 " "	480 75		
	294	Nov.	485	4-12 " "	242 67		
	306	Dec.	338	4-12 " "	169 17		
						4,177 37	
1873							
	329	April.	278	8-12 feet, @ 65 cts.	$181 13		
	346	July.	256	11-12 " 60 cts.	274 15		
	361	Aug.	554	4-12 " "	332 60		
	366	Sept.	975	" "	585 00		
	376	Oct.	987	6-12 " "	592 50		
	385	Nov.	522	2-12 " "	313 30		
	385	Dec.	202	8-12 " "	121 60		
					$2,400 28		
	353	Less overcharge			8 34		
						2,391 94	
							$7,914 84

Eastern Marble Co.

1872	J.						
	275	July & Aug.	777	6-12 feet, @ 70 cts.	$544 25		
	281	Sept.	323	" "	226 10		
	286	Oct.	218	" $1.00	218 00		
							$988 35

203 *Parker, Gilson & Dewey (Including P. & Co. & G., C. & W.)*

1872	J.							
	250	Feb.-Apr.	2,347	1-12 feet,	@ 60 cts.		$1,408 25	
	260	May.	746	"	"	$447 60		
			11	8-12 "	$1.00	11 67		
							459 27	
	261	June.	415	"	60 cts.		249 00	
	270	July.	738	10-12 "	"		443 30	
	280	Sept. 30. { July Ct'g. }	283	1-12 "	"	$169 85		
			322	9-12 "	$1.00	322 76		
						$492 61		
		Less amount charged July				443 30		
							49 31	
	280	Aug.	547	11-12 feet,	@ $1.25		683 75	
	280	Sept.	540	5-12 "	60 cts.		324 25	
	286	Oct.	787	6-12 "	"		472 50	
	295	Nov.	567	"	"		340 20	
	305	Dec.	143	9-12 "	"		86 25	
								$4,516 08
		Deduct overcharges				J. 305	$6 88	
						J. 285	98 07	
								104 95
								$4,411 13
1873								
	328	Apr.	1,115	2-12 feet,	@ 50 cts.	$557 33		
			45	6-12 "	80	36 65		
							$593 98	
	335	May.	1,676	11-12 "	50		838 45	
	339	June.	1,756	3-12 "	"		878 12	
	340	July.	1,237	7-12 "	"	$618 39		
		Less for bad broaching				56 97		
							561 42	

Parker, Gilson & Dewey, &c.—Continued.

	361	Aug.	2,069 4-12 feet, @ 50 cts.	$1,034 67		
	366	Sept.	1,734 10 12 " "	867 42		
	376	Oct.	1,155 10-12 " "	577 90		
	384	Nov.	1,242 10-12 " "	621 40		
	389	Dec.	1,427 3-12 " "	713 62	$6,686 98	
1874	398	Jan.-Feb.	2,526 6-12 feet	$1,263 29		
	398	Jan.-Feb.	Blast holes	5 00		
	428	May.	4,053 9-12 feet, @ 50 cts.	2,021 87		
	431	June.	4,322 10-12 " "	2,161 40		
	439	July.	4,293 11-12 " "	2,146 95		
	447	Aug.	3,192 8 12 " "	1,596 36		
	456	Sept.	2,510 9-12 " "	1,255 37		
	460	Oct.	2,109 2-12 " "	1,054 58		
	468	Nov.	2,639 10-12 " "	1,319 92		
	480	Dec.	2,550 5-12 " "	1,275 21		
					14,099 95	$25,198 06

Trojan Marble Co.

1874	J.					
	469	Nov.	471 11-12 feet, @ 55 cts.	$259 55		
	480	Dec.	420 9-12 " "	231 41		
						$490 96

Brandon Statuary Marble Co.

1872	J.					
	281	Sept.	290 feet, @ 60 cts.	$174 00		
	286	Oct.	583 9-12 " "	350 25		
	295	Nov.	275 6-12 " "	165 30		
						$689 55

			165 30		$689 55

204 *Eureka Marble Co.*

1872	J.							
	260	May.	255	10-12 feet,	@ 50 cts.	$128 58		
	261	June.	962		" "	481 00		
	270	July.	1,151	1-12	" "	577 54		
	270		112	2-12	" "	56 09		
	275	Aug.	1,211	10-12	" "	605 90		
	280	Sept.	1,539	2-12	" "	769 60		
	286	Oct.	1,934	8-12	" "	967 33		
	294	Nov.	1,598	6-12	" "	789 25		
							$4,375 29	
1873								
	328	Apr.	239	feet,	@ 50 cts.	$119 50		
	335	May.	1,187	5-12	" "	593 72		
	339	June.	1,558	3-12	" "	779 56		
	349	July.	1,350		" "	675 00		
	361	Aug.	917	1-12	" "	458 54		
	366	Sept.	2,414	4-12	" "	1,207 16		
	376	Oct.	1,619	2-12	" "	809 58		
	385	Nov.	877		" "	438 50		
							5,081 36	
1874								
	428	May.	1,496	6-12 feet,	@ 60 cts.	$897 90		
	431	June.	1,616		" "	969 60		
	439	July.	1,605	4-12	" "	963 20		
	446	Aug.	1,152	11-12	" "	691 75		
	456	Sept.	1,915	9-12	" "	1,149 45		
	460	Oct.	1,275	3-12	" "	765 15		
	471	Nov.	1,743	5-12	" "	1,046 05		
	480	Dec.	437	7-12	" "	260 70		
						$6,743 80		
	448	Allowed on measurement				13 40		
							6,730 40	
								$16,187 05

Brandon Quarry.

1873	J. 387	500 feet channels, @ 20 cts.				$100 00

Sheldon & Slason.

1873	J. 389		507	feet, @ 50 cts.			$253 50	
1874	407	Jan.	491	feet		$245 50		
	428	May.	1,073	feet, @ 60 cts.	$643 80			
				Use gadder	66 00			
						709 80		
	431	June.	1,251	feet, @ 60 cts.		750 60		
	436	Mar.	700	" 50 cts.	$350 00			
	436	Apr.	1,158 9-12	" "	579 45			
						929 45		
	436			Deduct 75 feet cuts		$2,635 35 45 00		
							2,590 35	
								$2,843 85

205 *W. W. Kelly.*

1873	J.							
	335	May.	837	8-12 feet, @ 55 cts.		$460 71		
	339	June.	600	8-12 " "		352 36		
	351	July.	1,000	3-12 " "		550 14		
	377	Aug.-Oct.	1,323	" "		727 61		
	378	Nov.	919	" "		505 45		
							$2,596 27	
	346	Dif. in measurement. Cuts May and June					50 27	
							$2,546 00	
		(J. 400, est'd, Nov. and Dec. cutting, $400.00. J. 398, Dec. estimate charged back for final correction, $400.00.)						
1874	456	Sept.	456	1-12 feet, @ 70 cts.	$319 72			
	456	Sept.	450	4-12 " 60 cts.	270 20			
						$589 92		
	461	Oct.	749	3-12 " 70 cts.		524 47		
							1,114 39	
								$3,660 39

Columbian Marble Co.

1873	J.						
	339	June.	431	6-12 feet, @ 60 cts.	$258 90		
	351	July.	560	" "	336 00		
	361	Aug.	651	1-12 " "	390 65		
	371	Sept.	418	10-12 " "	251 30		
	276	Oct.	1,065	3-12 " "	639 15		
	383	Nov.	335	" "	201 00		
						$2,077 00	
	353	Deduct overmeasurement				18 90	
							$2,058 10

Sherman, Adams & Williams.

1874	J.						
	431	June.	552	8-12 feet, @ 60 cts.	$331 50		
	439	July.	1,207	" "	724 20		
	447	Aug.	893	6-12 " "	536 10		
	456	Sept.	1,079	6-12 " "	647 70		
	460	Oct.	1,242	6-12 " "	745 50		
							$2,985 00

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Summary of Receipts from Cutting.

1871		
Suth. Falls M. Co.	$1,345 53	
		$1,345 53
1872		
Wheaton Mar. Co.	$4,843 66	
Rutland Mar. Co.	1,051 46	
Pittsford M. Q. Co.	2,679 00	
Suth. F. Mar. Co.	4,177 37	
Eastern Mar. Co.	988 35	
Parker, G. & Dewey	4,411 13	
Brandon S. M. Co.	689 55	
Eureka Mar. Co.	4,375 29	
		23,215 81
1873		
Pittsford M. Q. Co.	$4,766 80	
Suth. F. Mar. Co.	2,391 94	
Parker, G. & Dewey	6,686 98	
Eureka Mar. Co.	5,081 36	
Brandon Quarry	100 00	
Sheldon & Slason	253 50	
W. W. Kelly	2,546 00	
Columbian M. Co.	2,058 10	
		23,884 68
1874		
Parker, G. & Dewey	$14,099 95	
Trojan Mar. Co.	490 96	
Eureka Mar. Co.	6,730 40	
Sheldon & Slason	2,590 35	
W. W. Kelly	1,114 39	
Sherman, A. & W.	2,985 00	
		$28,011·05
		$76,457 07
Deduct receipts for month of December, 1874, and one-fifth of month of November		2,292 42
Total		$74,164 65

207 The foregoing table shows the receipts to the end of the year 1874, but, as the accounting ends with the 24th of November of that year, there should be deducted from the aggregate receipts of that year the receipts ($1,767.32) for the December cutting and one-fifth ($525.10) of the receipts for the November cutting. Making these deductions, it appears that the defendant corporation received from the use of the infringing machines during the period of the accounting the gross sum of seventy-four thousand one hundred and sixty-four dollars and sixty-five cents ($74,164.65).*

The ascertainment of the moneys thus received by defendants from the sale and from the use of machines embodying the patented invention has been a comparatively easy matter. To determine the proper allowance to be made defendants on account of the cost of the machines sold and the cost, maintenance, and working of those used in order to ascertain the "gains, profits, and advantages" accruing to them from their use of the Leschot invention has proved a more difficult task. In this matter the parties present theories widely at variance, not being in accord, in fact, upon a single material point.

The complainants, on the one hand, assert that while it is true that the hollow drill rod and the revolving boring head of defendants' machines constitute but a small part of the aggregate mechanism composing those machines, yet these parts are the vital portion, and that all the other parts are merely auxiliary to them, being selected from among the ordinary appliances of the machine-shop
by the exercise of mechanical skill only, and in their new use
208 not involving invention; that by reason thereof complainants
are entitled to all that defendants have received from their machines, both those sold and those used, after deducting the actual cost and a fair manufacturer's profit; that defendants' books, by reason of their uncertainty, are wholly unreliable as evidence of the cost of building or the cost of operating these machines, either individually or in the aggregate, and that the only possible mode of ascertaining such cost is by the estimates of skilled mechanics or constructors. Proceeding upon this basis, complainants contend that they are entitled to judgment for $42,175.43 on machinery sold (see their opening brief, p. 126) and to $42,933.37 on machines used (see opening brief, p. 176).

Defendants, on the other hand, contend that the presence in their machines of the features of invention covered by the second and third claims of the Leschot patent has not been of any advantage whatever, claiming that during the entire period of the accounting they might have made their drill heads without using this invention and yet have had machines capable of operating, if, indeed, not more efficiently than those actually built by them, at least as well. They further contend that their machines are complex organizations, embodying many patented and many unpatented inventions

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* Reduced in the final report to $72,359.96 by eliminating the receipts from the Suth. Falls M. Co. ($1,345.53) and those from the Brandon quarry ($100), and giving credit for allowance for damaged marble made in the Eureka Marble Co. ($362.16).

in addition to that of Leschot, and that the burden of proof is on the complainants to show what portion of the gains derived from the whole structure was properly due to the Leschot invention, but that complainants have failed to present any basis for such an apportionment of profits; and, finally, that the evidence shows that defendants derived no profits whatever from the infringing business, but, as shown by their statement, "Exhibit B," actually suffered a loss on their diamond-drill business from its inception, in 1869, to November 24, 1874, of $30,653.17, and during the period embraced in the accounting (as shown by their transcript of the items of Exhibit B, which pertains to that period) of $19,125.78. For
209 all and each of these reasons defendants contend that complainants are entitled to a nominal recovery only.

One of the questions presented by defendants is, in the judgment of the master, easily disposed of. Defendants claim that they might have used, with equal advantage to themselves and their customers, a modified construction of the diamond drill which would not have infringed the Leschot patent, and that therefore no part of their profits (assuming that they have actually realized profits) belongs to the complainants.

This view is based upon the theory that the second and third claims of the Leschot patent are necessarily restricted to the use of diamonds so arranged in the boring head as to project outwardly beyond the circumference thereof, and that, while in fact defendants' bits were provided with diamonds thus arranged, yet the tools would have been fully as efficient if the diamonds had been ground down flush with the periphery, and that this latter construction was open to defendants to use.

It seems unnecessary to discuss the testimony taken *pro* and *con.* in regard to the relative efficiency of the projecting diamonds and the so-called "flush" arrangement of diamonds. There seem to be two good and sufficient answers to defendants' position. One is this: The fact that a practical rotary boring head for rock boring could be made with flush diamonds (if this be a fact), so far as appears, was not known to the world, and certainly was not known to the defendants until after the interlocutory decree of the court herein and subsequent to the beginning of the period covered by the accounting. It was under the incitement of the injunction decree that defendants by experiment discovered, as they suppose, that there is no virtue in making the diamonds project. Manifestly, therefore,
210 being ignorant at the time of the possibility of using flush diamonds for the purpose, it cannot be said that such use was open to them.

A second reason for rejecting this claim of the defendants is that it has been decided at final hearing by the circuit court in this circuit that the defendants' modified tool armed with the so-called flush diamonds is an infringement of the claims of the Leschot patent. (Amer. Diamond Rock Boring Co. *vs.* Sheldon, 17 Blatch., 208.)

In ascertaining the cost of building, operating, and maintaining defendants' machines the master has chosen not to rely upon defendants' statement, "Exhibit B." The items (such, for instance, as "labor," "sundries," and "invoices") of which it is largely made up do not explain themselves nor are they taken bodily from any book of original entry to which reference can be made for explanations and verification. They are, in short, an expression of the conclusions of the book-keeper who prepared the statement, and, as the burden of proof is held to be on the defendants as to those items of which they would discharge themselves, the master has considered that Exhibit B itself is not competent evidence for the defendants. The defendants have made no other effort to prove the aggregate expense of their diamond-drill business nor have they presented any proof as to the separate cost of building the machines that were sold, except as possibly they may be considered to rely upon the conjoint estimate of Mr. Ball, their superintendent, and Mr. Rice, their book-keeper. They have, however, presented two other statements designed to show the expenses connected with their contract work.

One of these is the statement of C. B. Rice, consisting of four several tables, presented May 25, 1881, marked, respectively, "Def'ts' Exhibits Nos. 1, 2, 3, and 4, May 25, '81," which makes the
211 total cost of running and maintaining the machines $62,288.99, not making allowance for interest and general shop expenses and depreciation of machines. The uncertainty as to many of the items in this statement, particularly some of those in the column of Exhibit No. 4 headed "general bills" and aggregating $10,688.68, for which no vouchers have been presented, makes the statement unreliable. In fact, the master understands that the defendants themselves have abandoned this statement in favor of their subsequent one, presented October 26, 1881, and known as "Def'ts' Exhibit X" or "Exhibit C. B. Rice's Cutting Account, October 26, 1881." According to this latter account the cost of operating and repairing defendants' machines at work on contract cutting from June 1, 1871, to December, 1874, without including allowances for general expenses, was $63,914.60. It is claimed for this statement that each item in it is supported by its proper voucher. While the master has not examined all of the vouchers in detail, it sufficiently appears that it is only by implication or surmise and not by any direct testimony adduced that some of them can be connected with the account. For this reason, and because the mode of accounting hereinafter set forth has seemed on the whole the more satisfactory, the master has chosen not to adopt Defendants' Exhibit X.

The mode of ascertaining the cost of defendants' contract work, which seems the least subject to criticism and the most likely to approximate the truth, is to resort to the entries in defendants' journal and cash book and to compare the entries therein with defendants' ledger accounts.

The journal shows that defendants, in connection with their contract work, opened various so-called "consignment accounts" (such as "Wheaton Quarry Company Cons'g't," "Sheldon and Slason Cons'g't," "Stone Machine No. 1," "consignment, supply, and expense," &c., &c.), and transcripts of most of these ledger accounts are in evidence. The explanation of these accounts made
212 by Mr. Upham, president of the defendant corporation, and

by Mr. Rice, the present book-keeper, is that these accounts are intended to represent on the credit side the amounts received from the quarries for work done and on the debit side the expenses connected with such work, so far as such expenses are separable from the general expenses of the company, which was engaged in a general machine-shop business. The explanation is made that the "consignment, supply, and expense" account is a general account for those debits and credits relating to the contract work done with the diamond-drill machines which at the time could not conveniently be distributed to the specific quarry consignment accounts. This, it is said, was rendered necessary by the course of business of the company, which was as follows: The company usually had an agent at Rutland, Vt., who had general charge of the machines in that vicinity. Supplies and repairs would frequently be bought by or be sent to this agent in gross instead of being sent to the individual machines at particular quarries, and the agent would use such supplies and repairs as occasion might require and at stated times make return simply of the amount consumed without specifying (which sometimes doubtless could not have been done easily and conveniently) the particular quarry where each nut or bolt or each pound of coal or gallon of oil was used. The internal evidence of the books—the labor and machine-shop blotters, the day book, and the journal—seems fully to justify this view of these accounts. It seems to the master, therefore, that all items which, according to the books of original entry, are properly debited to these various consigment accounts, both the general account and the various special accounts, are proper charges to be made against the moneys received from the contract work done. Accordingly, the master has prepared from the journal entries and from the cash book the following ledger accounts, marked as "Schedule C," showing the debits and credits on account of expenses incurred in direct connection, as he understand it, with the cutting done by the defendants:

SCHEDULE C.

Stone Machine No. 1.

1871. July.	To machine-shop	200 J.	$20 40	1871. Nov.	By Suth. Falls Mar. Co. (coal had Aug. 31)	222 J.	$8 50
Aug.	" " "	206 J.	13 76				
"	" N. Y. Belt'g & Pkg. Co. (invoice Aug. 10th)	208 J.	39 48				$8 50
Oct.	" machine-shop	214 J.	2 25				
Nov.	" N. Y. Belt'g Co. (bill of hoes Nov. 18)	219 J.	17 63				
"	" Suth. Falls Marble Co. (for wages, coal, and sun. extras, as p'r ac.)	222 J.	746 29				
Dec.	" Suth. Falls Mar. Co. (check rec'd Dec. 5)	226 J.	318 21		By bal.		1,149 52
			$1,158 02				$1,158 02

Rutland Marble Co. Consignment.

1871. Oct.	To machine-shop (mdse.)	214 J.	$28 05	1871.	By bal.		$121 53
	" " " (labor)	216 J.	40				
Nov.	" " " (mdse.)	221 J.	29 20				
	" Albert Ball	221 J.	4 50				
Dec.	" machine-shop	226 J.	4 38				
	" " "	226 J.	55 00				
			$121 53				$121 53
1872. Feb.	" Rutland Marble Co (their statement of cutting expenses)	242 J.	$610 97	1872.	By bal.		$610 97
			$610 97				$610 97

Parker, Gilson & Dewey Consignment.—Parker & Gilson and Gilson, Clement & Woodfin.

1872. April.	To Parker, Gilson & Dewey (expenses of cutting)	250 J.	$663 60	1872.			
	" J. M. Putnam & Co.	253 J.	73 75				
May.	" " " "	256 J.	82 21				
June.	" P. P. Story (pay-roll and expenses April and May)	266 J.	417 19				
July.	" machine-shop	268 J.	28 25				
Aug.	" Z. V. K. Willson	273 J.	71 94				
Sept.	" P. S. Story (pay-roll May)	281 J.	103 50				
	" " (" June)	"	110 50				
	" " (" July)	"	114 87				
	" " (" Aug.)	"	112 12				
"	" P., G. & D. (their statement)	285 J.	66 05				
Oct.	" P. P. Story (Sept. & Oct. pay-roll)	291 J.	310 50				
"	" P., G. & Dewey (their statement)	"	86 75				
Nov.	" P. P. Story	295 J.	10 00		By bal.		$2,251 23
214			$2,251 23				$2,251 23
1873. May 31	" P., G. & D.	337 J.	$80 75	1873.	By bal.		$80 75
			$80 75				$80 75
1874.	" Parker & Gilson	339 J.	$7 17				
	" Gilson, Clement & Woodfin (rent and repairs for Aug.)	348 J.	27 97	1874.	By bal.		$35 14
			$35 14				$35 14

Sutherland Falls Marble Co. Consignment.

1872.				1872.			
May.	To J. M. Putnam & Co. (bill May 8)	256 J.	$78 97	Sept.	By S. F. M. Co. (rebate on repairs)	281 J.	$13 00
June.	“ Putnam & Curtis (coal and fgt.)	261 J.	87 50				
“	“ Suth. F. M. Works (fgts., labor, and reps.)	261 J.	351 29				
“	“ machine-shop	263 J.	12 98				
July.	“ “ “	267 J.	11 70				
“	“ “ “	268 J.	15 02				
Aug.	“ Wilson (coal)	273 J.	63 78				
“	“ S. F. M. Co. (July-Aug. exps. of men, reprs., etc.)	274 J.	503 08				
“	“ machine-shop	278 J.	60 70				
Sept.	“ S. F. M. Co. (expenses)	281 J.	227 40				
“	“ machine-shop	282 J.	8 00				
Oct.	“ S. F. M. Co. (their acct. for Oct.)	290 J.	188 52				
Nov.	“ S. F. M. Co. (their acct.)	294 J.	128 75		By bal.		1,724 69
			$1,737 69				$1,737 69
1873.				1873.			
Feb.	“ machine-shop	315 J.	$22 07	Feb.	By S. F. M. Co. (mdse. Feb. 31, 315 J.	316 J.	$22 07
April.	“ S. F. M. Co. (their bill, labor and sund., Dec. to May)	329 J.	144 28				
Dec.	“ cash	191 C.	26 25		By bal.		170 53
			$192 60				$192 60

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Sheldon and Slason Consignment.

1874.				1874.			
Feb.	To Sheldon & Slason (paid Underhill)	407 J.	$66 00				
April 2	" cash	199 C.	138 25				
July.	" S. & S. (coal & wood in June)	436 J.	120 25		By bal.		$324 50
			$324 50				$324 50

Wheaton Marble Co. Consignment.

1872.							
Apr. 15	To cash (f'g't)	127 C.	$26 40				
Apr. 30	" J. M. Putnam & Co.	253 J.	170 00				
May.	" mach. shop	256 J.	9 90				
"	" " "	257 J.	20 43				
"	" " "	257 J.	29 23				
June.	" W. Q. Co. (f'g't on mach.)	260 J.	41 40				
Sept.	" W. Q. Co. (wood and work)	280 J.	49 52				
Oct.	" W. Q. Co. (pay-roll for Sept.)	286 J.	230 30				
"	" W. Q. Co. (pay-roll for Oct.)	291 J.	230 92				
"	" mach. shop	291 J.	72 00				
Nov.	" W. Q. Co. (their ac. sund.)	294 J.	44 80				
"	" P. P. Story (pay-roll, Nov.)	295 J.	291 75				
"	" P. P. Story (exp. for Dec.)	295 J.	118 99				
Dec.	" D. F. Esty (5,747 ft. @ 20)	302 J.	1,149 40		By bal.		$2,485 04
			$2,485 04				$2,485 04

Eastern Marble Co. Consignment.

1872.				1872.			
July.	To Smith & Davis (oil)	269 J.	$33 05				
Aug.	" Eastern M. Co. (f'g't on mach.)	275 J.	104 00				
"	" Eastern M. Co. (exp's fuel, help, &c.)	275 J.	107 22				
"	" mach. shop	278 J.	46 46				
Sept.	" E. M. Co. (sund., as per their state't)	281 J.	184 38				
"	" mach. shop	283 J.	89 00				
Oct.	" E. M. Co. (their statement)	287 J.	56 12				
"	" W. H. Staples (p'd by him)	287 J.	9 00		By bal.		$629 23
			$629 23				$629 23

216 *Pittsford Marble Quarry Co. Consignment.*

1872.				1872.			
May.	To J. M. Putnam & Co.	256 J.	$100 00				
J'ne 20	" cash (coal and f'g't)	131 C.	34 40				
July 17	" " (wood and iron)	135 C.	10 50				
Oct.	" P. P. Story (pay-roll, Sept)	286 J.	117 42				
"	" P. P. Story (Oct. pay-roll and f'g'ts)	291 J.	194 71				
"	" mach. shop	291 J.	5 00				
Nov.	" P. P. Story (pay-roll, Nov.)	295 J.	131 12				
Dec.	" D. F. Esty (2,446 ft. @ 20)	302 J.	489 20				
"	" P. M. Q. Co. (their bill sund.)	306 J.	37 05		By bal.		$1,119 40
			$1,119 40				$1,119 40
1873.				1873.			
May.	To J. W. Holmes (rep'g heater)	334 J.	$14 67	May 31	By G. F. Case (bill of P. M. Q. Co. for coal and sund. to May 31)	337 J.	$142 76
"	" P.M.Q.Co. (their bill, labor and sund.)	336 J.	162 76				
Dec. 18	" cash	191 C.	46 25		By bal.		80 92
			$223 68				$223 68

Brandon Statuary Marble Co. Consignment.

1872. Sep. 17.	To cash (rep's on boiler)	141 C.	$6 90				
Oct.	" B. S. M. Co. (their statement, pay-rolls, &c., Nov., '72)	291 J.	205 68				
"	" P. P. Story	291 J.	15 00		By bal.		$227 58
			$227 58				$227 58

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Eureka Marble Co. Consignment.

1872. May.	To J. M. Putnam & Co.	256 J.	$85 42	1872. Sep. 30	By P. P. Story (Aug. pay-roll twice ch'g'd)	285 J.	$132 99
June.	" Putnam & Curtis (coal and freight)	261 J.	78 50				
"	" machine-shop	262 J.	5 90				
"	" J. P. Upham (fr'ghts)	263 J.	43 40				
"	" P. P. Story (exp. May)	266 J.	22 25				
July.	" Eureka M. Co. (sund.)	270 J.	42 45				
Aug.	" Wilson (coal)	273 J.	60 72				
"	" Putnam & C. (coal, freight, etc.)	"	80 00				
"	" Eureka Marble Co. (blacksmithing)	275 J.	19 24				
Sep. 17	" cash (pay-roll, etc.)	141 C.	131 09				
"	" coal and freight	"	39 60				
Sep. 30	" Story (pay-roll, May)	281 J.	86 67				
"	" " (" June)	"	128 34				
"	" " (" July)	"	164 99				
"	" " (" Aug.)	"	132 99				
Oct.	" Eureka M. Co. (their bill)	286 J.	48 40				
"	" Story (4 cords wood)	"	22 00				
"	" Story (Sept. and Oct., pay-roll)	291 J.	467 37				
"	" Story	291 J.	69 50				
"	" machine-shop	"	14 65				
Nov.	" Story (pay-roll, Nov.)	295 J.	94 17		By bal.		1,704 96
			$1,837 95				$1,837 95

Consignment Supply and Expense.

1872.				1872.			
May 31	To Smith & Davis (bill 15th May)	255 J.	$163 25	July.	By Smith & Davis (deductions, &c.)	271 J.	$3 70
" 31	" labor	258 J.	20 50	Dec. 30	" P. P. Story (sale of horse)	305 J.	40 00
June 30	" "	265 J.	69 63	" 30	" Pittsford M. Q. Co. (bbl. oil)	306 J.	23 75
" 30	" P. P. Story (his expenses to June)	266 J.	85 74	" 30	" Z. V. K. Wilson (coal)	306 J.	85 94
July.	" Thos. Ross & Co. (sundries, &c.)	269 J.	12 61				
"	" J. M. Putnam & Co. (for difference in ac. to balance)	271 J.	12				$153 39
Aug. 31	" mach. shop	276 J.	48 37				
" 31	" " "	278 J.	162 00				
" 31	" J. R. Upham (sundries)	279 J.	75 00				
" 31	" cash (freights)	139 C.	15 50				
Sept. 19	" " (R. C. Brosford)	143 C.	35 00				
" 30	" mach. shop (mdse.)	283 J.	50 00				
" 30	" " " (labor)	383 J.	20 40				
" 30	" P. P. Story (his statement)	281 J.	184 84				
" 30	" P. P. Story (salary, Apr. to Sept.)	285 J.	600 00				
" 30	" Z. V. K. Willson (sundry bill)	285 J.	416 47				
Oct. 30	" P. P. Story (board, f'g't, and sundries)	286 J.	84 11				
" 30	" mach. shop (labor)	287 J.	87 79				
" 30	" P. P. Story (sundries)	291 J.	143 97				
" 30	" " "	291 J.	65 48				
" 30	" mach. shop (mdse.)	291 J.	346 65				
Nov. 30	" Z. V. K. Willson	295 J.	187 48				
" 30	" P. P. Story	295 J.	169 49				
" 30	" mach. shop	293 J.	59 85				
Nov. 30	To stone mach. ac. and mach. shop	295 J.	260 00				
Dec. 31	" mach. shop	301 J.	11 25				
" 31	" Morris Tasker & Co. $105 63 " Z. V. K. Wilson 164 40	302 J.	270 03				
" 31	" P. P. Story (sal., Nov. and Dec)	303 J.	300 00				
" 31	" sundry expenses	305 J.	230 23		By bal.		4,022 37
			$4,175 76				$4,175 76

219 *Consignment Supply and Expense*—Continued.

1873.				1873.			
Jan. 30	To mach. shop (labor)	312 J.	$98 21	June 30	By Parker, G. & D. (coal and hose)	344 J.	$23 21
Feb. 28	" " " "	314 J	62 94	Aug.	" E. M. Co. (oil)	178 C.	25 00
" 28	" " " (mdse.)	315 J.	11 40	Dec. 31	" M. Quinn	386 J.	59 00
M'ch 31	" " " (labor)	318 J.	167 45				
" 31	" " " (mdse.)	319 J.	53 00				$107 21
Apr. 30	" " " (labor)	324 J.	178 05				
" 30	" M. Quinn	327 J.	59 00				
" 30	" Z. V. K. Willson	327 J.	47				
" 11	" cash (horse, &c.)	165 C.	125 00				
May 31	" mach. shop (labor)	331 J.	89 25				
" 31	" " " (mdse.)	333 J.	1 98				
" 31	" cash (pd. Webster)	169 C.	5 00				
June 30	" labor	340 J.	44 80				
" 30	" mach. shop (mdse.)	343 J.	63 78				
" 21	" cash (M. Quinn)	171 C.	61 00				
" 30	" " (R. L. and J. P. U. to Rut'd)	173 C.	22 00				
July 31	" R. H. Dyer	346 J.	59 84				
" 31	" mach. shop (labor)	347 J.	1 20				
" 31	" Suth. Falls M. Co. (freights)	355 J.	89 78				
Aug. 31	" J. P. Upham (exp. Rutland, June & July	363 J.	44 65				
Sept. 30	" Colum. M. Co. (f'ght on mach.)	371 J.	40 10				
Oct. 31	" J. P. U. (expenses as per bill book)	373 J.	345 93				
Dec.	" Pittsford Q. Co. (sundries for Dec.)	389 J.	51 70				
" 31	" mach. shop (labor)	390 J.	21 07				
" 31	" " " (mdse.)	391 J.	189 47				
" 31	" G. F. Case (his bill, $1,126.07, $58.70)	386 J.	1,184 77				
" 31	" G. F. Case (cuts in '73—$42,976\frac{8}{12}$ ft., @ 27)	386 J.	11,603 69				
" 31	" balance G. F. Case's ac.	180 L.	6,268 95		By bal.		20,837 27
			$20,944 48				$20,944 48

1874.				1874.			
Jan. 1	To G. F. Case ("left on hand ex.," 1873)	386 J.	$843 93	July 31	By Sheldon & Slason (goods from Story)	435 J.	$5 10
" 31	" mach. shop (labor)	396 J.	83 69	Aug. 31	" Sherman, A. & W. (goods from Story)	444 J.	4 60
" 31	" " " (mdse.)	397 J.	35 48	Sept. 30	" sundries (various quarries)	451 J.	544 93
" 31	" P. P. Story (his rep't No. 1)	398 J.	810 43	" 30	" A. Maxwell (2 extra heads)	453 J.	500 00
" 31	" P. P. Story (his rep't No. 2, Jan. and Feb. pay-roll, &c.)	398 J.	678 62				
	Am't carried for'd		$2,452 15		Am't carried for'd		$1,054 63

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1874.	Am't bro't for'd		$2,452 15	1874.	Am't bro't for'd		$1,054 63
Jan. 31	To Gilson & Dewey (coal)	398 J.	105 00	Oct. 31	" sundries (various quarries, reported by Story)	461 J.	73 85
" 16	" cash	193 C.	25 00				
Feb.	" Eureka M. Co. (sundries in 1873)	404 J.	83 70	Dec. 31	" sundries (various quarries, reported by Story)	468 J.	10 60
"	" Colum. M. Co.	404 J.	68 54				
"	" mach. shop (labor)	405 J.	139 28	" 31	" Maxwell (Buckley, for running mach.)	474 J.	24 00
"	" " " (mdse.)	405 J.	18 76				
M'ch 31	" " " (labor)	410 J.	213 27	" 31	" sundries (various quarries, reported by P. P. S.)	474 J.	66 01
" 31	" " " (mdse.)	411 J.	159 51				
" 31	" " " (")	411 J.	3 90	" 31	" S. A. & W. (to square ac.)	486 J.	2 30
" "	To Woolworth M'f'g Co. (bill of extras)	412 J.	51 74	" 31	" W. W. Kelly (correction of estimate on damages, 1873)	486 J.	536 66
"	" S. F. M. Co. (sund. to machines)	413 J.	38 33				
Apr. 30	" machine-shop (labor)	418 J.	60 63	" 31	" st. mach. ac. (errors in M'ch and May)	472 J.	232 77
"	" " (mdse.)	420 J.	526 42	" 31	" bal.	319 L.	3,249 33
"	" Linen Co. (grindstone)	420 J.	6 00				
"	" D. L. Kent & Co. (sundries)	421 J.	20 25				
May 31	" machine-shop (labor)	424 J.	27 60				
"	" Z. V. K. Willson (coal)	425 J.	241 50				
"	" machine-shop (mdse.)	427 J.	448 82				
"	" R. M. Co. (sund. per bill)	428 J.	37 50				
"	" cash	201 C.	53 20				
"	" sund. (various quarries)	428 J.	680 34				
June 30	" Willson (coal)	433 J.	177 26				
"	" machine-shop (labor)	430 J.	44 50				
"	" " (mdse.)	432 J.	548 09				
July 31	" sund. (various quarries and Z. V. K. Willson)	435 J.	402 45				
"	" machine-shop (labor)	439 J.	219 68				

Consignment Supply and Expense—Continued.

1874.					
July 31	To machine-shop (mdse.)	441 J.	$479 12		
“	“ “ (“)	441 J.	29 70		
Aug. 31	“ “ (labor)	444 J.	33 43		
“	“ Gil., C. & W. (sund.)	444 J.	128 89		
“	“ machine-shop (mdse.)	446 J.	254 55		
Sep. 30	“ T. Ross	451 J.	10 75		
“	“ machine-shop (labor)	452 J.	82 53		
“	“ “ (mdse.)	455 J.	171 20		
Oct. 31	“ “ (labor)	459 J.	11 91		
“	“ N. Y. B. & P. Co. (hose tö Story)	460 J.	14 10		
“	“ Parker, G. & D.	461 J.	49 20		
“	“ R. Mar. Co.	461 J.	3 72		
“	“ machine-shop (mdse.)	463 J.	542 05		
Nov. 30	“ “ (labor)	468 J.	57 85		
“	“ “ (mdse.)	471 J.	527 07		
Dec. 31	“ stone mach. ac. (sundries)	472 J.	453 80		
“ 31	“ stone mach. ac. (carbons)	472 J.	3,057 15		
“ 31	“ mach. shop (mdse.)	472 J.	534 00		
Dec. 31	“ Gilson, C. & W.	473 J.	52 30		
“	“ Z. V. K. Willson (coal, etc.)	473 J.	170 53		
“	“ J. W. Holmes (rep'rs on machines, several mos.)	476 J.	221 51		
“	“ machine-shop (labor)	477 J.	20 00		
“	“ “ (mdse.)	479 J.	33 00		
“	“ sundries	479 J.	125 32		
“	“ Z. V. K. Willson (coal 4 mos.)	482 J.	1,358 24		
“	“ Gilson, C. & W.	481 J.	57 74		
“	“ G. F. Case (to close doubtful acc't.	484 J. 193 C.	354 40		
221	Am't carried for'd		$15,689 39	Am't carried for'd	$5,250 15

1874.	Am't bro't for'd		$15,689 36	1874.	Am't bro't for'd	$5,250 15
Dec. 31	To P. P. Story (salary, Feb. to Dec.)	485 J.	960 00			
" 31	" P. P. Story (sundries—various bills from Apr. to Dec.)	485 J.	8,600 57			
" 31	" P. P. Story (ch'k not col'd)	485 J.	71 12			
" 31	" P. P. Story (add'n to estimate of his due, made Dec., '73)	486 J.	63 65			
" 31	" Trojan Mar. Co. (sundries)	486 J.	37 18			
" 31	" D. F. Esty	488 J.	340 81			
" 31	" J. P. Upham	488 J.	61 07		By bal.	20,571 73
			$25,821 88			$25,821 88

Summary by Years.

1871				1874		
	Stone Mach. No. 1	$1,149 52			P., G. and Dewey cons'g't	$35 14
	Rutland Mar. Co. cons'g't	121 53			Sheldon & Slason "	324 50
			$1,271 05		Cons'g't sup. and exp. "	20,571 73
1872						$20,931 37
	Rutland Mar. Co. cons'g't	$610 97			Deduct proportion of expenses for period from Nov. 24 to Dec. 31, '74	1,712 68
	Wheaton Mar. Co. "	2,485 04				
	Pittsford Mar. Co. "	1,119 40				
	Parker, G. & Dewey "	2,251 23				$19,218 69
	Suth. Falls M. Co. "	1,724 69				
	Eastern Mar. Co. "	629 23			Total	$56,434 68
	Eureka Mar. Co. "	1,704 96				
	Brandon S. M. Co. "	227 58				
	Cons'g't sup. and exp. "	4,022 37				
			14,775 47			
1873						
	Pittsford Mar. Co. cons'g't	$80 92				
	Parker, G. & Dewey "	80 75				
	Suth. Falls M. Co. "	170 53				
	Cons'g't sup. and exp. "	20,837 27				
			21,169 47			

222 The separate accounts composing the foregoing Schedule C are made up to the end of the year 1874, but after making proportionate allowance for the last six days of November and for the month of December (not included in the period of the accounting) it appears that defendants expended in running and in maintaining the machines employed on contract work the sum of fifty-six thousand four hundred and thirty-four dollars and sixty-eight cents ($56,434.68)* directly chargeable thereto.

The reason for making up these accounts to the end of the year 1874, and then deducting a proportionate amount of the expenses for that part of the year (Nov. 24 to Dec. 31) not included in the accounting, is that many of the bills paid in the month of December, as appears by the journal entries, related in part to expenses incurred prior to November 24, but without adequate data being found to properly distribute each bill to the respective periods of time before and after that date. It has seemed to the master that the only equitable way of ascertaining the expenses belonging to the period prior to November 24 is to ascertain the expenses of the entire year, as by Schedule C, and then apportion these between the two parts of the year in the ratio of the receipts from cutting for the corresponding parts of the year. By Schedule B it appears that the aggregate receipts for cutting for 1874 were $28,011.05, and the amount corresponding to that part of the year subsequent to November 24, as stated in the summary, was $2,292.42. By Schedule C the aggregate expenses for cutting for the year 1874 were $20,931.37, and, by the rule above stated, the proportionate part of these expenses for the time subsequent to Nov. 24 would be $1,712.68. It is
223 thought also that it is only by bringing the accounts down to the end of 1874 and then making proportionate deduction for the time after Nov. 24 that due effect can be given to the item of $3,249.33 on the credit side of the "consignment, supply, and expense" account, which is testified to by defendants' witness Rice as representing supplies and repairs previously charged into this account, but left on hand at the end of the year.

As to some features of the accounts composing "Schedule C"—particularly sundry items that have provoked sharp discussion—explanation seems necessary. The accounts, it will be seen, contain no entries of the valuation of the machines when put at work in the quarries, although the journal shows that they were always charged into the proper consignment account at a valuation. The evidence shows the machines as on hand when the accounts were closed, and therefore it has not been deemed necessary to encumber the present accounts with cross-charges.

On journal page 285 appears the following entry:

"P., G. & Dewey cons'g't ac.		$541 37
P., G. & Dewey, 1 mo. cutting twice entered	443 30	
P., G. & Dewey, claim for extra prices not allowed	98 07"	

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* Decreased to $56,427.87 by allowances, as explained in final report.

So far as concerns the item of $143.30, for which the journal would charge the P., G. & D. cons'g't account as having been "twice entered," the master is satisfied, on examination of the journal entries on pp. 270 and 280 relating to the same matter, that the item of $443.30 was not twice entered, as supposed. The journal, in making the corrected statement of the July cutting on p. 280, made due allowance for the amount ($443.30) previously entered on p. 270. For this reason the above P., G. & D. cons'g't account contains no entry corresponding to the above-quoted journal entry.

224 The charges on account of the quarries, as above given in the various quarry consignment accounts, are explained upon the proved fact that the quarry companies frequently paid bills for supplies or labor in connection with the contract machines and were subsequently reimbursed therefor.

The items relating to G. F. Case in the "consignment, supply, and expense" account for 1873, as follows: $1,184.77, $11,603.69, and the succeeding item of $6,268.95, as well as the Case item, $843.93, in the same account for 1874, are explained as follows: * In the year 1873 G. F. Case, an employee of the Sullivan Machine Co., undertook to do the contract work of said company in some of the quarries about Rutland for twenty-seven (27) cents a channel foot. Case was without means, and the company was to furnish the machines, advance the funds for current expenses, and supply repairs, charging the same to Case's account. Case thought he could do the work inside the price named, and the president of the company testifies that he hoped Case would be able to do it, but he considered that, whether he could or not, this arrangement would be a good way to secure efficiency and economy. The evidence shows that long before the close of the season it became apparent that Case could not fulfil the contract, and another man, Story, was sent to aid him in the work. An account was opened with Case for that year, in which it was intended to debit him with all moneys, supplies, and repairs received by him for this work. A transcript of this account, as taken from defendants' ledger, is in evidence. The master has carefully compared the same with the original entries in the journal and the cash book, and finds the various items of the account justified by such entries. This account shows Case as charged in the year 1873 with $21,272.65, against which he received through the year various
credits (shown by the journal to be for sundries furnished the
225 quarry companies, sundries returned to foundry, &c.), amount-
ing to $379.06, leaving the aggregate net charges against him $20,893.59. The account is balanced December 31, 1873, by giving him credit for "sundries, $11,603.69," "sundries, $3,020.95," and "bal. to consignment account, $6,268.95." Two of these three items are readily explained by reference to the journal, p. 386, where occurs the following entry:

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* See Upham, Dec., 1881, Q. 9-38, X Q. 91-104, 116.

"Sundries, dr. to G. F. Case		$3,020 95
Cons., sup., and ex. ac., his bill	1,184 77	
Mach. shop (allowed on ch'ges and rep's)	992 25	
Cons., sup., and ex. ac., left on hand ex.	843 93	
Cons., sup., and, ex. $42,976\frac{8}{12}$ feet, at 27 (cuts in '73)		11,603 69"

From this entry it is apparent that in balancing Case's account at the end of the year he was allowed $1,184.77 for moneys expended in connection with the cutting business; $992.25 on charges and rerepairs (which may mean that he had previously been charged for repairs not sent or that he had been charged at too high a rate, or it may mean that of the repairs sent him for the contract work the portion represented by this sum had been used for other purposes), and $843.33, the value of those repairs and supplies which he had received but had not used. Then, allowing him $11,603.69 (what, according to the rate agreed upon in his cancelled contract, he would have been entitled to receive for the work actually done), it was found, in balancing his ledger account at the end of the year, that the work had cost, for labor, supplies, and repairs, the further sum of $6,268.95. This amount has never been collected from Case, and apparently no effort has ever been made to collect it. The master is satisfied, from the evidence of the books and the proofs generally, that the so-called contract with Case was of an experimental character at best, and virtually was abrogated long
226 before the year closed, and that the company continued the
work with the expectation that it would have to bear all the actual cost of it.

Referring now to the several Case items in the general "consignment, supply, and expense" account above cited, they are carried into that account for the purpose of making the account show all the items directly connected with the cost of cutting which are not found in the special quarry consignment accounts, and in this the master has adopted the same course which the defendants' bookkeeper adopted at the time, as appears from the transcript of the ledger account in evidence.

With the above explanation of the Case account and the journal entries relating thereto, it is plain that the "consignment, supply, and expense" account should be charged with the $1,184.77, allowed Case as per his bill, and with the two items of $11,603.69 and $6,268.95, which last two items, together with the $1,184.77, would represent the amounts actually expended through Case or in his name on cutting in the year 1873. In addition to this the "consignment, supply, and expense" account should be charged with the $843.93, representing the sundries on hand at the end of 1873. These had previously been charged to Case to be used on contract work, and, not having been used in the year 1873, were on hand for use in the year 1874. Case's account being closed and properly credited with this item, the general "consignment, supply, and expense" account is to be correspondingly debited.

Objection has been made to defendants' consignment accounts on

the ground that when repairs were sent to Case, or whoever else was in charge of the machines at Rutland, they may have been used to repair machines that had been sold; but the testimony is explicit that whenever this was done it was the duty of the agent to report
all such matters to the home office, and that then the con-
227 signment account would receive a corresponding credit and
the proper quarry would be charged.* Mr. Upham, Mr. Rice, Mr. Story, and Mr. Roys all testify to this effect. This would have been the proper thing to do, and presumably it was done. Various of the credit items in the above "consignment, supply, and expense" account are shown by the journal to be of this very character—*e. g.*, the credit item, $544.93 for "sundries," under date of Sept. 30, 1874, is explained by journal entries on p. 451 to be for various supplies reported by P. P. Story (at the time in charge of the contract machines at Rutland) to have been furnished to four different quarries, which are named, with their respective amounts. The amount of repairs supplied in this way to machines sold was small. Ordinarily such repairs were furnished directly from Claremont and charged directly to the quarry accounts. The witnesses state this and the books show it conclusively.

The following-named entries found in the journal, for the reasons hereinafter given, are not included in Schedule C.

(1.) Entry in journal at p. 357:

"Sutherland Falls M. Co., dr. to S. F. M. Co. cons'g't---- $274 15
Cutting in August, viz., $456\frac{11}{12}$ feet @ 60c."

This, as shown by the journal, was not posted into the ledger. Manifestly it is an erroneous repetition of the July cutting entered in journal at p. 346. The August cutting is found in J. at p. 361.

(2.) Entry in journal at p. 357:

"Eureka Marble Co., dr., to Eureka M. Co. cons'g't------ $675 00
Cutting in August, viz., 1,350 feet @ 50c."

This was never posted into ledger, and manifestly was an
228 erroneous repetition of the July cutting entered in journal at
p. 349. The August cutting is found in J. at p. 361.

(3.) Entry in journal at p. 366:

"Columbian Marble Co., dr., to Col. Mar. Co. cons'g't------ $390 55
Cutting in Sept., viz., $650\frac{11}{12}$ @ 60c."

This was never posted into ledger. Manifestly it is an erroneous entry.

The August cutting is entered in J. at p. 361. The Sept. cutting is entered in J. at p. 371.

In the foregoing statement, Schedule C, the amount charged against the Eureka Marble Co. for the month of Sept., 1872 ($769.60), seems fully warranted by the journal entry on p. 280, although it does not appear in the transcript of defendants' ledger account with Eureka Marble Co. cons'g't. Manifestly it was an error not to include it in such account.

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*See Upham, Dec. 1881, Q. 35–'8, X 116; Rice, Oct. 1881, X Q. 76–91.

Recurring now to the amount shown by the accounts composing Schedule C to have been expended directly upon the contract work ($56,434.68), the question arises whether there should not be added to it, in ascertaining defendants' "gains, profits, and advantages," some sum, to be determined on an equitable basis, on account of the general expenses of the corporation; also a further amount on account of the depreciation of the machines.

It seems to the master that some allowance should be made on account of the general expenses of the business of the Sullivan Machine Co. It is undoubtedly the case that the repairs sent to the contract machines were entered in the journal, and consequently are charged in the above-stated consignment accounts at figures some-
what above the bare cost of the material and the labor put
229 upon it, but, as the master understands, this was done by
way of apportioning to these repairs certain general expenses pertaining directly to the machine-shop or foundry (such, for example, as the wages of the foremen), but that it does not include a full allowance for the more general expenses of the defendants' business. These expenses are stated by Mr. Rice, the book-keeper, to be from January 1, 1872, to December 1, 1874, as follows: Interest balance, $2,984.92; stationery, $745.60; insurance, $2,378.85; general expenses, including salary of officers and some other expenses not covered by the pay-roll, $26,147.93; freight bills paid at Claremont, $4,989.69; taxes, $484.44; general repairs to real estate, $990.83; rent of pattern store-house, $76.28; advertising, $297.94; sundries, $217.70; estimated rent for real estate and water-power owned by the Sullivan Machine Co., $14,000.

Leaving out the amounts above named for insurance, for taxes, for sundries, and for rent of the real estate and water-power owned by the defendants (which do not seem to be proper items to be included in establishing the basis of an apportionment—Steam Stone Cutter Co. *vs.* Windsor M'n'f'g Co., 17 Blatch., 24), the aggregate general expenses from January 1, 1872, to December 1, 1874, is $36,233.17. Adding to this a proportionate sum for the seven months of 1871 included in the accounting, and deducting a proportionate amount for the six days in November, 1874, not included in the accounting, the amount will be $43,272.73. The journal shows, upon a computation made by the master, that the total labor of the machine-shop from June 1, 1871, to December 1874, was charged at $67,048.92, and that of this aggregate $29,330.33 was charged to "stone-machine account," to the various consignment accounts, and to Case (in the year 1873). The labor thus charged to stone-machine account is abundantly shown to be on account of the
construction of new diamond-drill machines, while that
230 charged to Case and the consignment accounts is for repairs
of machines employed in cutting. It would seem fair to apportion the general expenses as above given between the diamond-drill business and the other work of the establishment in the ratio

of the respective labor charges in the machine shop; and the amount of the general expenses thus apportioned to diamond-drill machines is to be again distributed between the machines sold and those used, and here the only available equitable basis is to make the distribution in the ratio of the relative amounts received by the defendants for machines sold and for cutting done—that is (as hereinbefore shown), in the proportion of $72,446.25 to $74,164.65. Upon this basis of calculation the allowance to be made to defendants on account of general expenses in ascertaining the net receipts from cutting will be $9,571.50.*

In addition to the above allowance to the cutting business on account of general expenses, defendants urge a general and indefinite claim to still further allowances on the ground that they were pioneers in the development and introduction of a new channeling machine; that this machine was necessarily of slow growth and involved many changes of an expensive and unremunerative character; that by reason thereof their diamond-drill business, including the entire period from its commencement in 1869 down to the end of 1874, was a source of loss and not of profit, and that therefore equity would dictate that the expenses should be so apportioned that no one branch of the business should be made to appear to have realized a profit.

In answer, it is to be said, first, that it is not established to the satisfaction of the master that defendants' diamond-drill business has
been conducted at a loss; secondly, defendants do not show in
231 any tangible form, nor otherwise than by general statements and
surmises, what these other general expenses are; and, thirdly, it is not seen upon what ground the profits made between June, 1871, and November, 1874, should be reduced by reason of the extraordinary expenses connected with the development of the business in its earlier days and at a time when complainants had no interest in the Leschot invention.

As to the alleged depreciation of the machines from use, the master sees no ground upon which to make any allowance therefor. There is no evidence that the machines were not as serviceable on the 24th of November, 1874, as when they were first put to work; and, in fact, assuming that parts when worn or injured are replaced, there seems no good reason why the life of the machines may not be prolonged indefinitely. At any rate, the defendants appear to have kept their machines in full working condition.

From the above the cutting account stands as follows:

Whole amount rec'd for cutting from June 1, 1871, to Nov. 24. 1874		$74,164 65
Expenses, as per consignment accounts	$56,434 68	
Allowance for general expenses	9,571 50	
		66,006 18
Net receipts		$8,158 47†

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* Changed in final report to $9,454.67.

† Changed in final report to $6,474.42.

232 Assuming that the above amount ($8,158.47) represents the profits of the defendants from the use by them of the infringing machines, it remains to be considered what part of this sum constitutes the "gains, profits, and advantages" accruing from the presence in the machines of the patented invention of Leschot.

Defendants urge that a channeling machine provided with "core bits" (annular boring heads), such as alone are shown and described in the Leschot patent, would not be practical and could not successfully compete with the Wardwell and other steel-drill channel-chopping machines which have been in use for years; that it became necessary to a practical diamond-drill channeler to close the head so as to cut all the rock within the hole and to provide the tool with sleeves and guides to secure perfect accuracy of direction in the holes bored; that the "solid" head, as defendants' conical bit is called, is the subject of a patent, as is also the "guiding sleeve" used to form the first set of holes, and the Case guide used to form the intercutting holes, and that great study and ingenuity have been expended in devising and organizing the complete machine, various features of which are the subjects of patents purchased by the defendants for the special protection of this business. Without the modifications of and the additions to the Leschot invention, made or purchased and controlled by defendants, they assert that the Leschot devices would be of no value whatever for channeling uses, for which alone defendants have used them, and hence, they urge, such modifications and additions are, to say the least, as valuable and as intimately connected with the profits made as are the diamond tool and the hollow drill rod of the Leschot patent. They also assert that the burden of proof is on the complainants to establish the basis on which to apportion the aggregate net profits between the invention of the patent in suit and the other inventions or features
233 embodied in the machines and that, as complainants have
not attempted to do this, they cannot recover more than nominal damages.

The master does not agree with the defendants in the proposition that the burden of proof is on the complainants to distribute the profits among the various parts of or the various inventions embodied in the machine. If the patented invention had been an improvement of an existing mechanism and defendants, without license, had applied an infringing device to such existing mechanism, undoubtedly such would be the law. But that is not the present case. Leschot invented a new rock-boring tool and not a mere improvement of a previously existing tool. His invention, as the master understands the patent to be interpreted by the court, is radical and constitutes the foundation of a new class of mechanism and one which has proved of great value in the art to which it pertains. Under these circumstances, if the defendants, in order to gain a foothold in a new industry, have found it necessary to make use of the Leschot invention, but in doing so have chosen to modify it in certain respects in order to secure a fancied or a real economy and superiority, it is believed that they should establish the extent of the advantage which such modifications have contributed to the working of their machines. This would seem to be in accordance with the view of the Supreme Court in City of Elizabeth *vs.* Nicholson Pavement Company (97 U. S., 126).

If, in opposition to the above, it should be said that Leschot's rock-boring tool was not a radically new departure in the art, but was simply an improvement upon the old Herman tool, the improvement consisting in attaching Herman's diamond-armed cylinder to a tubular drill rod through which a supply of water could be forced (the existence of hollow boring rods adapted to receive a supply of water under pressure being old in the arts in other 234 connections, as appears from the article of M. Fauvelie in Le Technologiste for the year 1847), and by means of which it could be driven into the rock with a positive rotary motion, instead of progressing by the force of gravity, as in Herman's own use of the tool (which is believed to put the case the most favorably for defendants), a sufficient answer would seem to be that the doing of this very thing produced a tool or mechanism capable of an entirely different class of work from any for which the old tool had been or could be used. It certainly would be of no avail for the defendants to compare the profits which they have made with the profits which they might have made had they used the gravity boring head of Hermann, since it will not be questioned that a machine with such a tool would have been, during the period comprehended in the accounting, wholly impracticable for channeling.

On examining into the character of the alleged improvements upon the Leschot drill and additional inventions which defendants claim to have embodied in their channeling machines, and to which they claim that whatever of success their machines have attained has chiefly been due, the master finds as follows: So far as regards the general organization of the machines—the boiler, the engine, the frames and the mounting of the same, the feed devices, the reversing mechanism, the track, and the appliances for securing accuracy of spacing—it seems to be established that these do not involve anything vital or material which might not be supplied, and presumably was not supplied, by the exercise of that measure of mechanical skill which is available in any well organized machine shop. If upon some minor features of these parts patents have been granted, it can hardly be contended that such parts might not in practice be replaced by devices free to the public and known to the shops. All of these parts, then, are to be looked 235 upon merely as concomitants of the diamond drill or boring head, without which there is no reason to suppose that defendants would have made them either for sale or for use. Not involving any vital invention, it is not thought that defendants are entitled to special allowance on account of them.

As regards the drill bit itself and the devices for guiding it, considered in their final and most approved form, the master considers the weight of evidence to be that defendants' machines are thereby made more efficient and economical than if provided with core bits of the Leschot pattern and without the Case intercutting guide and the loose collar or sleeve. The testimony relating to the relative performance of the "core" bit and the "solid" bit is very conflicting and largely speculative. Love and Ball, the mechanics who organized defendants' machines, tried the core bits, and undoubtedly in good faith, and Ball testifies that they abandoned it because of the difficulties encountered in using it in the marble quarries, the nature of which difficulties he and other witnesses of the experiment state in detail. The substitution of the solid or conical bit improved the first or experimental machine, so that Ball and his associates were encouraged to proceed in the building of other and improved machines.

It does not appear, however, that the first machine, a six-spindle drill, was ever a really successful machine, even with the solid bits, although it was sold. The probability is that much of the difficulty found with it in the first tests was the result of imperfection in its construction otherwise than in the form of the bits. The subsequent machines differed from it in various material respects. The somewhat elaborate experiment made in behalf of complainants upon a single selected block of marble to demonstrate the feasibility of channeling with a core bit does not seem at all conclusive of the question of relative economy. While it proves that under favorable
236 circumstances, and such as never occur in practice, the core
bit can be made to cut channels in marble, it does not demonstrate that it can be relied upon to compete commercially with the existing steel-drill machines, which have gained such a place in the art as to establish the maximum price for channeling work. On the whole evidence, however, it would seem that for channeling a machine with defendants' solid conical bits and provided with suitable guides is to be preferred to one with annular or core bits, but unless it can be made to appear that the core bit cannot in practice be used for this purpose at all (which proposition seems not to be justified by the evidence), the master does not find in the evidence any way of determining the relative advantage of the two forms of bit, and, as the burden of proof rests upon the defendants to establish the measure of superiority of the one over the other in order to secure the benefit of a corresponding apportionment of the profits, it must be held that they are not entitled to any allowance on this account.

Much testimony *pro* and *con* has been given in regard to the loose collar or sleeve which defendants use, and which is the subject of patent No. 92014, granted to Case June 29, 1869, as also in regard to the intercutting guide patented to Case March 22, 1870, No. 101,095. Defendants contend that these devices are very valuable; that they are inventions made necessary by the imperfect and unprofitable working of the machines as at first constructed, and that whatever of profit defendants have made has been since the invention and adoption of these parts. The functions of the first of the above devices, the loose collar, is to guide the tool while cutting the first holes so as to make the holes as nearly straight as possible. The function of the second device is to guide the tool while intercutting or removing the web between a first hole and the hole being bored, and it does this

by moving down in the first hole as the tool descends
237 in boring the adjacent hole, thus holding the tool to its proper
direction. This last device is essentially new, being different both in function and effect from ordinary machine-shop devices for spacing distances for holes to be bored, and there is no doubt that the practical adoption of the invention by defendants has relieved them from losses to which they were previously subjected by reason of imperfect work caused by the deflection of the drills from straight lines and consequent damage to the marble in raising. It appears, however, that the intercutting guide was not generally adopted by defendants until the winter of 1873–'4. Story's testimony as to the history of the invention is explicit.* It was made and tried in 1872. In 1873 it was put in two of the machines, and in the winter of 1873–'4 all the machines were fitted with it. It thus appears that the greater part of the cutting done was without the aid of this guide, and defendants have failed to show to what extent their profits were increased after its adoption. That it was not vital to their business is proved by the fact that for years they did cutting without it. An analysis of the tables hereinbefore given shows that, notwithstanding the general adoption of the Case guide by defendants in 1874, their profits for that year for the amount of cutting done were, for some reason, less than for the year 1872. The "loose collar" or sleeve patented in 1869 appears to have been placed on all the machines used by defendants after June, 1871. It would seem, however, that the only difference between this device and a guide formed by simply elongating the body of the drill bit (which was matter of public right) is increased durability. The loose collar is intended to stand still; consequently it will wear less. What the economy resulting from this difference amounts to is not shown. Mr. Ball, when inquired of respecting it, declined even to estimate it. For the reasons thus indicated the
master is of the opinion that defendants are not entitled, in
238 estimating their profits, to any allowance, because of the use
which they have made of the Case "loose collar" and the Case "intercutting guide."

As opposed to any mode of estimating the cost of defendants' contract work to be obtained from their books, complainants, alleging that the books are not to be relied upon for any such purpose, have presented estimates of the cost of such work. The master does not think that any one of these should be adopted. The books, for the reasons hereinbefore set forth, seem to afford a reasonable solution of the problem; and, again, complainants' estimates do not seem meritorious.

Roy's statement to the effect that he once concluded from a study of the matter that he could afford to do the contract work of the Sullivan Co., keeping the machines in repair, and pay a royalty of fifteen (15) cents a foot, is without value. He never made a proposition to do the work on such terms, and it does not appear that he was really competent to estimate. He certainly overestimated the average work of a channeling machine, putting it at 1,400 feet per month, when it does not much, if any, exceed 40 feet per day.

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* See also Ball, Feb., 1881, X Q. 275–285, 368.

Ward is not shown to have any competency to estimate. His estimate placing the cost of channeling at a fraction over twelve (12) cents is manifestly absurd. The cost of the carbons alone, used in repairing defendants' drill bits, according to the testimony of Mr. Ball, who kept an accurate account of them, would be more than half of that amount.

The estimate of General Tompkins, who places the cost below twenty-five (25) cents a foot, while undoubtedly reflecting the honest conviction of the witness, is not fortified by such a statement of details and by such practical experience with this particular class of machines and such knowledge of all the varying conditions 239 under which channeling machines are operated in marble quarries (work differing widely in its details from the work of prospecting drills, in regard to which the witness undoubtedly stands as an authority without a superior) as to justify its adoption, so long as any other mode of reaching a conclusion is available.

From the foregoing it appears to the master, and he accordingly so finds, that the "gains, profits, and advantages" which defendants received from the use which they made of the Leschot invention in the channeling machines which they operated from June 1, 1871, to November 24, 1874, amount to eight thousand one hundred and fifty-eight dollars and forty-seven cents ($8,158.47).*

It remains to consider "the gains, profits, and advantages" received by the defendants from the use of the patented invention of Leschot in the machines which they have made and sold within the period of the accounting.

These machines, as shown by Schedule A, are eleven two-spindle machines, twelve gadders, and two three-spindle drills, and the aggregate of the moneys collected for them was $72,446.25.

No attempt is made to show from defendants' books the actual cost of each of these machines, nor, in fact, the aggregate cost of them all.

Defendants' book-keeper testifies, in effect, that it is impossible to make up an account that will show this with even approximate accuracy. In the absence of accurate data estimates of the cost of such machines have been submitted. At the request of complain- 240 ants' counsel Mr. Ball, who organized and superintended the building of the infringing machines, has made an estimate of the cost of building the gadders and the two-spindle machines, said estimate forming sheets 3, 4, and 5 of the paper in evidence marked "Exhibit Ball's Estimates;" and complainants have also examined upon the same point Mr. Reynolds, of the Delamater Iron Works.

Ball's estimates will be first considered. "These estimates," Mr. Ball says, "on the face of the written estimates do not include my own time, which was devoted to the construction of the drilling machines, nor the cost of tools nor any office, incidental, and travelling expenses." Aside from these factors he estimates the cost of the two-spindle upright drill sold to D. L. Kent & Co. (understood to be a fair type of that class of machines) to have been, including two drill bits or heads, $3,095.84. Nine of the so-called "channelers" were of this type, and at this rate their aggregate cost would have been $27,862.56. As the above estimate includes $542.50 for a boiler and boiler appliances and two of the said nine machines were sold without boilers this aggregate should be reduced by $1,085.00, leaving the amount $26,777.56.

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*Changed in the final report to $6,474.42.

Two of the so-called "channelers" were for tunneling, and these Mr. Ball estimates, allowing for three drill heads, to have cost $2,559.36 each or, in the aggregate, $5,118.72. These two machines were sold without boilers, and boilers are not included in the estimate.

The cost of the "gadding machine" sold to Maxwell and provided with two drill heads Mr. Ball estimates to have been $1,096.44. Assuming this to have been an average gadder, the twelve, at this rate, cost $13,157.28; or, allowing for the absence of boilers not supplied with three of the machines, at the estimated cost of $206.00 each, the amount is $12,539.28.

No estimate is furnished by Mr. Ball of the cost of the two three-spindle drills, the aggregate price charged for which appears to have
been $5,280.27. If it be assumed that the cost of these ma-
241 chines sustained the same relation to the price charged for
them as the estimated cost of eleven two-spindle drills sustained to the price charged for such machines (which, in the absence of a better basis of calculation, would seem reasonable) the cost of these two three-spindle machines, according to the data included in Mr. Ball's estimate, may be set down at $2,975.67.

The account will then stand as follows:

Cost of 9 two-spindle upright drills	$26,777 56
" " 2 " " tunneling "	5,118 72
" " 12 gadders	12,539 28
" " 2 three-spindle drills	2,975 67
Total	$47,411 23

Mr. Ball's estimates, as above explained, do not purport to include any due and sufficient charge on account of the general expenses of the defendant corporation. There would seem the same reason for adding to the estimated cost, as above given, an allowance for general expenses as existed in the ascertainment of the cost of the contract cutting. In the master's opinion the apportionment of general expenses to the cost of machines sold should be made on the same basis as in the case of machines used. The general expenses to be apportioned, as before ascertained, are $43,272.73; the entire labor charges in the machine-shop for the period of the accounting are $67,048.92; the labor charge to the aggregate diamond-drill business for machines built and for repairs on machines used amounts to $29,330.33, and the amounts received, respectively, from the sale and from the use of machines are $72,446.25 and $74,164.65. Apportioning the general expenses according to the labor charges, it

will be found that $18,921 of the same belongs to the combined diamond-drill business, and apportioning this amount between the machines sold and those run on contract in the ratio of the
242 respective aggregate amounts received from these two classes
of machines it will be found that that portion of the general expenses apportionable to the machines sold is $9,349.50* Adding this amount to the aggregate cost, as indicated by Ball's estimates, the entire cost will be $56,760.73.†

The master understands it to be conceded by complainants' counsel that, after ascertaining the cost of the infringing machines that were sold, the defendants are entitled to an allowance for manufacturer's profits, and that ten per centum of the cost is the usual and a reasonable allowance on this account. Increasing $56,760.73 by ten per centum, the amount becomes $62,436.80. Deducting this last amount from the aggregate receipts for machines sold ($72,446.25), the apparent profits derived from the building and sale of the twenty-five infringing machines (eleven channelers, twelve gadders, and two 3-spindle drills) amount to $10,009.45.‡

If it be important to ascertain the entire cost of these machines with a view to determine the profits made on the entire machines, and not simply on the drill heads and the drill rods, the master deems the estimates of Mr. Ball to be more intelligent and reliable than those of Mr. Reynolds. The latter witness, although a man of large experience in building machinery, is far from exact in his testimony. In one deposition he states that the Delamater Iron Works have built the diamond-drill machines for the complainants at prices that amount to less than thirty cents a pound, and that this left a margin of profit; but in a later deposition he puts the figures at from "thirty to fifty" cents a pound, claiming that the rule of his establishment is to be satisfied with a ten per cent. margin as manu-
243 facturer's profits.** This one discrepancy in the testimony
of this witness seriously impairs the value of any inference to be drawn from his testimony in regard to the cost of defendants' machines; but, aside from this, it by no means follows that because complainants' machines, understood to be built in large number, can be constructed at a stated price defendants' machines, which differ from the former in many particulars, can be built at the same price.

It does not seem to the master that anything should be allowed from the profits on the machines sold ($10,009.45) on account of the patented invention of defendants or the general mechanism which they have used in organizing this machine. So far as concerns their alleged improvements—such as the conical form of the bit, the loose sleeve or collar, and the intercutting guide—while they may have contributed in some measure to the perfection of the machine, it does not appear that defendants procured a higher price by reason of them. On the gadders the intercutting guide, of course, was not

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*Changed in the final report to $9,466.33.
† " " " $56,877.56.
‡ " " " $9,870.94.
** Dep'n of Dec., '80, Q. 24, and dep'n of April, '81, Q. 26, 28.

used, nor is it pretended that the loose sleeve is essential. On the channelers the loose sleeve was generally used, but there is no reason to think that the machines would not have sold as readily and at as high a figure if, instead of the loose sleeve, the drill bit had been made with an elongated solid body. Some of the channelers were sold without the intercutting guide, and the price paid was the same as for the machines with it. The principal question arises in connection with the solid or conical head. If it were established that a channeler with core bits would not be practicable an apportionment of profits on account of the modification which defendants have made in the form of the bit would become necessary, but the proofs do not support the supposition. As before stated, it appears to the master that the "solid" bit is on the whole better for channeling than the "core" bit, although the latter might be used.
244 What the measure of its superiority is has not been shown, and perhaps under all the circumstances it would be impossible to show it. At any rate, if, as the master holds, the burden of proof is upon the infringer to establish the advantage arising from the use by him of a modification of the invention infringed upon when that invention is not a mere improvement upon an existing mechanism, but constitutes, as in the present case, a distinctively new creation, the defendants here cannot avail of the uncertain additional advantage which they may have received from making their bits conical rather than annular, since they have failed to point out the amount of such advantage.

While the above computation has been made by the master to show the profits of defendants upon the machines sold, some question has arisen in his mind whether in the case of these machines defendants are to be charged for profits upon the entire structure or only upon the boring heads and the tubular drill rods, which are the specific devices covered by the second and third claims of the Leschot patent.

If, as complainants contend, all the parts of the machines made and sold by defendants, other than the infringing drill bits and drill rods, were such as required no invention to supply in connection with such bits and rods, and such that they or equally efficient devices might have been supplied by any skilled mechanic without infringing upon any valid patents, why might not the customers of the defendant corporation have bought their drill heads and drill rods from said corporation and built the machines themselves by adding the other necessary parts, and in such event could the defendants have been held accountable for profits beyond those arising from the sale of the heads and rods alone? Would it not have been necessary in such case for the complainants to seek their
245 further remedy by proceeding against the users of the machines? And how is the case different when the users of the machines have chosen to buy from the defendants not only the parts which technically infringe the claims of the patent in suit, but all the other and non-infringing parts used in conjunction with the infringing devices to make up the organized machines?

It does not appear that the defendants have made a business of manufacturing and selling drill heads to the trade. They have in some instances supplied extra drill heads to the purchasers of their machines, but, so far as appears, have never sold diamond drill heads or bits to other persons. Their business has been the manufacture and sale (or use) of channeling machines, gadding machines, and the like, and there is no reason to suppose that they would ever have made and sold diamond drill bits otherwise than in connection with the machanisms that go to make up the complete machines in question. Under these circumstances the master is of opinion that complainants' claim against the defendant corporation on account of the machines sold should not be limited to the drill bits and rods, but should embrace the entire machines.

For the foregoing reasons it seems to the master, and he accordingly so finds, that the "gains, profits, and advantages" which defendants received from the presence of the Leschot invention in the machines which they made and sold from June 1, 1871, to November 24, 1874, amount to ten thousand and nine dollars and forty-five cents ($10,009.45).*

It remains to ascertain "the damages in excess of profits" suffered by the complainants by reason of the infringement.

246 Commercially, the business of the American Diamond Drill Company was the manufacture and sale or use of prospecting drills and of drills for boring blast holes. The company never made a channeling machine nor a gadder, nor were their prospecting drills or their drills for boring blast holes practically adapted for channeling or gadding in competition with the prior existing percussion drills. It does not appear that the company had an established license fee for the use of the Leschot invention even in those classes of machines which they did make and sell.

Complainants having no established license fee for the use of the invention, and not being engaged in a line of business which was interfered with by the defendants' machines, it seems clear that the damages they have suffered are merely nominal.

The suggestion is made that complainants stood ready to supply the quarries with channeling machines and gadders containing the patented invention, but were excluded therefrom by the fact that defendants forestalled them by the introduction of the infringing machines, for which reason it is suggested that complainants have been damaged at least by the loss of that market which defendants have secured.

In answer to this position there seems to the master no good reason to suppose that the complainants would have made any channelers or gadders even if defendants had never entered on a similar enterprise. The eighteen channelers, the twelve gadders, and the two three-spindle drills made and sold or made and used by the defendants have fallen far short of supplying the entire available field for these classes of machines. The president of the defendant corporation testifies that not more than one in a hundred of the quarries in the country are supplied by that company (Upham, Ap'l

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* Changed in the final report to $9,870.94.

26, 1881, Q. 71); and the president of the corporation com-
247 plainant testifies that there are a "large number" of marble quarries in New York State (in which State the defendants have but two machines) and that there are "hundreds of other quarries where channelers and gadders" could be used advantageously. (Tompkins, Apr. 12, 1881, Q. 98.) The fact that complainants never placed a single channeler or gadder in any one of these "hundreds of other quarries" not occupied by the defendants would seem conclusive that it has not been defendants' infringement that has kept them out of the market.

In conclusion, then, the master finds that the "gains, profits, and advantages" arising to the defendants from the use by them of the inventions covered by the second and third claims of the Leschot patent from June 1, 1871, to November 24, 1874, were ten thousand and nine dollars and forty-five cents ($10,009.45) on machines made and sold and eight thousand one hundred and fifty-eight dollars and forty-seven cents ($8,158.47) on machines made and used on contract work, making the aggregate $18,167.92,* and that there have been no "damages in excess of profits" suffered by the complainants by reason of defendants' manufacture and sale or use of infringing machines.

248 Upon the reading of the foregoing preliminary report to the parties counsel for the complainants filed the following written objections and requests on the part of complainants:

The complainants herewith present their objections to the report of the master herein as read to them and submitted for their suggestions and objections in galley proof, reserving the right agreed by stipulation to make exceptions to the said report when filed, without being limited to such exceptions as would be covered by the objections and requests herein stated as follows:

First. Complainants object to that portion of the master's report which allows the defendants for general expenses in the cutting or contract accounts the sum of $9,571.50, or any sum whatever, for the reasons that this amount is not found upon the statement of any witness properly supported by such proof as would permit the same to be charged against the complainant in any properly stated account; that it is the statement of an officer of the company who was not an officer at the time these alleged expenses were incurred; it is a statement that is estimated by such officer, wholly unsupported by any proofs, such as entry in the books of the defendant corporation or by the statements in detail of those persons who are now connected with the company and who have been called as witnesses by the defendant and to whom a portion of such general expenses were alleged to have been paid in salaries and as disbursements by them, and for the further reason that the books of the defendant show that such general expenses have been already included in the expenses allowed by the master in the profit charged by and allowed to defendant in its labor and merchandise account, including profits on diamonds used.

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*Changed in the final report to $16,345.36.

Second. Complainants' counsel objects to the report of the master wherein he admits the statement of G. F. Case as showing the expenses for contract cutting done under the superintendence of said Case for the year 1873, for the reason that said statement 249 contains entries of payments to Case entirely outside of any payments required for or connected with such cutting, and requests the master to find that the only amount which should be allowed for contract cutting for the year 1873 should be the amount for which a contract price was made with said Case, viz., 27 cents per foot, and make the total amount which should be allowed Case, or for any expenses connected with contract cutting for the year 1873, the sum of $11,603.69, the same being the contract price for such cutting done by Case in said year 1873.

Third. The complainants object to the finding of the master for the reason that on the amount found by the master to be the profits or saving made by the defendants during the period covered by this accounting interest on the same has not been computed and allowed the complainants from the date of the interlocutory decree herein. Complainants' counsel requests the master to amend his report so as to include interest on the amount which he shall find for the said gains, profits, and advantages from contract cutting, computing the same from the date of the interlocutory decree up to the date of the filing of his report herein.

Steam Stone Cutter Co. *v.* Windsor M'f'g Co., 17 Blatch., 33, 34, 35.

Steam Stone Cutter Co. and Windsor M'f'g Co., 18 Blatch., 48.

Machines Sold.

Fourth. Complainants object to the finding of the master wherein he has omitted crediting the complainants with the price of the channelers sold to the Brandon Statuary Marble Company for $5,000 and has charged the complainants or credited the defendants with the amount of cost of such machine, and request the master either to allow the complainants the sum for which said machine was sold or to deduct the amount allowed to the defendants as the cost of such machine. There is no proof that the debt for the full price of the machine is a bad one and has not been collected by receipt of value of some kind or is not collectible. The possession of a good right of action for price of goods sold against a solvent defendant is as much "profits" as cash.

Steam Stone Cutter Co. *vs.* Windsor M'f'g Co., 17 Blatch., p. 27.

Fifth. The complainants object on the same grounds as stated in the fifth (fourth) objection to the crediting to the complainants or charging the defendant with the sum of only $1,000 for the three-spindle drill sold to Hollister for the reason that the said drill was sold for the sum of $2,800, and complainant has been charged 250 or the defendants credited with the whole cost of said three-spindle drill, to wit, $——, and request the master either to allow the complainants the full sum of $2,800, for which said drill was sold, or to proportionately deduct the alleged cost of said machine for same reasons as above stated.

Sixth. Complainants object to the allowance of $9,349.50, made by the master for the general expenses connected with the construction and sale of machines, as having been already computed and allowed in the alleged cost of the machines, as not being supported by any proof, and including the general expenses connected with seven machines constructed, but not sold, and still in the possession of the defendants.

See former brief, pp. 21, 22.

Seventh. The complainants object to the allowance of ten per cent. for manufacturers' profits for the reason that the same has been already allowed and included in the allowance by the master for general expenses, based on Mr. Ball's estimate, who included said ten per cent. in his estimate of cost, which the master has adopted.

See former brief, pp. 13, 14, 15.

Eighth. The complainants object to the finding of the master for the reason that on the amount found by the master to be the profits or savings made by the defendants during the period covered by this accounting interest on the same has not been computed and allowed the complainants from the date of the interlocutory decree herein. Complainants' counsel requests the master to amend his report so as to include interest on the amount he may find for the said gains, profits, and advantages from the sale of such machines from the date of the interlocutory decree up to the date of the filing of his report herein.

Steam Stone Cutter Co. *vs.* Windsor M'f'g Co., 17 Blatch., 33, 34, 35.

Steam Stone Cutter Co. *vs.* Windsor M'f'g Co., 18 Blatch., 48.

Additional Objections.

Ninth. Complainants object to the master receiving or adopting defendants' statement, "Exhibit A," for the reason that the same has never been admitted to be a true and correct statement of the things contained therein, nor has any testimony been taken in relation to it by the complainants or defendants nor any any examination made of the defendants by complainants respecting it; that the books of defendants show that they made and sold many other heads—under entries of repairs to heads—but which
251 were in fact new heads and constituted new infringements, for which no statement has been made, if the finding is to be limited to profits on heads only, and on the further ground that the same was not produced under the order of the master.

Tenth. Complainants' counsel objects to the finding of the master that the defendants received for the machines sold, viz., 11 channellers, 12 gadders, and 2 three-spindle drills, the sum of $72,446.25, whereas he should have found that the defendants had received from the sale of such machines the sum of $79,765.98.

Eleventh. Complainants' counsel objects to the finding of the master that the amount received for channel cutting or contract cutting was the sum of $——, whereas he should have found the amount received by defendants for such cutting was the sum of $74,470.43.

Twelfth. Complainants' counsel objects to the finding of the master in that he finds that the defendants expended in running and maintaining machines employed on contract work the sum of $56,424.68, and complainants request the master to find that the defendants had only expended the sum of $32,032.05 for the running and maintaining of such machines.

Thirteenth. Complainants object to the finding of the master that the various items of the account called "G. F. Case account" or the consignment, supply, and expense account for 1873 are justified by original entries in the journal and cash book, and also on the ground that even if the entries in such account are found in the journal and cash book they are not such as to entitle them to be charged against the receipts of that year from any contract cutting work by the defendants, but consist to a large extent of entries of money paid to Case or on his account for matters unconnected with the cutting business, and specially objects to the following items:

1873, Ap'l 11.—Cash, horse, etc., 165 C, $125.00.

And also to the item in consignment, supply, and expense account as follows:

1874, Dec. 31.—G. F. Case (to close doubtful account), 193 C, $354.40.

Fourteenth. The complainants further object to the finding of the master in reference to said G. F. Case account, and specially to the admission therein of the sum of $6,268.95, charged December 31st, 1873 (page 386 of the defendants' journal, under the words "balance to consignment account"), because defendants have failed to
252 show that this amount was not subsequently collected from Case or that it could not have been collected from him, said amount being the difference between his, Case's, contract price for the cutting of that year and the amount beyond said price which the defendants advanced or paid to him.

Fifteenth. Complainants object to the master's finding that the so-called contract with Case was essentially of an experimental nature, and which was virtually abrogated long before the year closed, or that said Case was not capable of fulfilling the terms of the contract.

Sixteenth. Complainants' counsel objects to the master's adopting the "course which the defendants' book-keeper adopted," in so far as he has found that the consignment, supply, and expense account shows the items directly connected with the cost of cutting, which are not found in the special quarry consignment accounts, of which copies have been submitted, for the reason that the said consignment, supply, and expense account contains many items which complainants claim are not connected with the cost of cutting, and should not be charged against the same or be allowed to the defendants.

Seventeenth. The complainants object to the finding of the master that the defendants' consignment, supply, and expense accounts are correct or admissible on the ground that many of the entries on the same are unsupported by proper vouchers or testimony sufficient to prove their correctness.

Eighteenth. The complainants object to the finding of the master that the general expenses to be charged to the contract cutting work of the defendants is the sum of $9,571.50 and request the master to find that the general expenses have been already allowed to defendants in amounts allowed them as cost of doing this work.

Nineteenth. Complainants object to the master's finding that the expenses for cutting amounted to the sum of $56,434.68.

Twentieth. Complainants object to the finding of the master that the "elaborate experiments made by complainant" are not reliable and sufficient to demonstrate the feasibility and practicability of channelling by core bits as economically, if not more economically, than by the so-called solid bits.

Twenty-first. Complainants object to the finding of the master that the "complainants' estimates do not seem meritorious."

253 Twenty-second. Complainants object to the master's finding that the average work of the channeling machine does not exceed forty feet per day, whereas the testimony of defendants' witnesses is to the effect that the average work of a channeling machine is nearly sixty feet per day.

Twenty-third. Complainants object to the master's finding that the estimate of General Tompkins as to the cost of channel cutting by the diamond drilling machines was not such as to justify its adoption by the master.

Twenty-fourth. Complainants object to the master's finding that the cost of the nine two-spindle upright drills and the two two-spindle drills and twelve gadders and the two three-spindle drills amounted in the aggregate to $47,411.23, whereas he should have found that the total cost of the twelve gadders was $11,613.33, that the total cost of the eleven two-spindle drills was $29,556.74, and the cost of the two three-spindle drills $2,600, making in all a total cost of $43,970.17.

Twenty-fifth. Complainant objects to the master's finding that the total profit to which the complainant is entitled on the sale of said machines is the sum of $10,009.45, whereas complainant insists that he is entitled to the sum $35,985.96 as profit on such machines.

Twenty-sixth. Complainants object to the master's finding that "the solid bit is on the whole better for channeling than the core bit."

Twenty-seventh. Complainants object to the master's finding that the complainants' drills were not practically adapted for channeling or gadding in competition with other drills.

Twenty-eighth. Complainants object to the master's finding the complainants' company had not an established license fee or a regular price for the doing of every kind of work capable of being done by a diamond drilling machine.

Twenty-ninth. Complainant objects to the master's finding that there is no good reason to suppose that complainant would have made any channelers or gadders, even if defendants had never entered on a similar enterprise, as being contrary to the testimony of General Tompkins, one of the officers of complainant corporation.

254 Thirtieth. Complainant objects to the master's finding that the number of infringing machines made or sold by the defendants have fallen far short of supplying the entire available field for these classess of machines.

Thirty-first. Complainant objects to the finding of the master with regard to the profits derived from the machines used by defendants on contract or channel cutting, for the reason that the master has not, in the absence of other reliable proof and the failure of defendants' books of account or statements submitted by them to accurately show what such profits were, considered and adopted as the best proof of such profits the profits received by the defendants from the use of such machines shown by the testimony of Charles B. Rice, the treasurer of the defendants, taken at *the* Claremount, New Hampshire, on August 3d, 1880, in the presence of the master, which was as follows:

Question by Mr. Thompson to Mr. Chas. B. Rice:

"Q. Have you at any time rented any of your drilling machines; if so, at what price and under what conditions?

"A. We have now a machine rented to the Quarry Marble Company from month to month at $200 per month, they running night and day, they repairing and running it, wear and tear excepted, we delivering the machine to them; we have already changed the machine once and are now called upon to change it again, we paying freight."

Complainants claim that in the absence of other sufficient proof the said price should be found to be the price or profit which defendants realized from the use of the seven machines owned and used by them in such contract cutting during the whole period covered by this accounting. The net profit on the seven machines owned and operated by the defendants in this class of work for three years, on an average of eight working months in each year, would make twenty-four months; seven machines at $200 a month per machine makes $1,400 per month for the seven machines, and the twenty-four months at $1,400 per month makes a total of net profit of $33,600, which amount the master is requested to find as being the profit made by the defendants from the use of these seven machines during the period covered by the accounting.

255 Defendants' counsel also filed the following written objections on the part of defendants:

First objection. The defendant objects to the use of the words "in the main" in the sentence beginning, "The items contained in this table (Schedule A) are taken, in the main, from defendant's statement, Exhibit B," because the items in Schedule A are all found in Schedule B unchanged.

Second objection. The defendant objects to the item in Schedule B under the heading "Sutherland Falls Marble Co.," which is as follows:

"1871 (J., 222).—Cutting from June 30 to November 13 ($2{,}691\frac{1}{12}$ feet at 50c., estimated), $1,345.53"—

Because the cutting referred to was done by a machine not owned by the defendant, but owned by R. W. Love, or a member of his family.

The entry in journal (p. 222) shows that the cutting in question was done by "No. 1 stone machine."

This machine was built by Mr. Upham, in the year 1868, before the defendant company was organized. The entry in journal (p. 184) identifies this machine.

Mr. Upham testified before the master, April 26th, 1881, in answer to question 20, as to the ownership of this machine.

In confirmation of this testimony we find in journal (p. 230) that the balance of "stone machine No. 1 account" was transferred to R. W. Love's individual account in December 1, 1871.

The item in question was therefore properly omitted from all of the accounts furnished by the defendant before the master.

Besides, no objection was taken before the master that any such item had been omitted from the defendant's accounts, and its attention has not been called to this item, except by the Master's Schedule B, and defendant has had no opportunity to produce testimony as to this item since its attention has been called to the item in Schedule B.

Third objection. The defendant objects to the item in Schedule B under the heading "Brandon quarry," to wit:

"1873 (J., 387).—500 ft. channels at 20c., $100.00"—

For the same reasons that are stated under "second objection." This cutting was done by machine No. 1.

Fourth objection. The defendant objects to the amount in summary appended to Schedule B deducted for receipts of months November and December, 1874.

256 The receipts for November were as follows:

P., G. & Dewey	$1,319 92
Trojan	259 55
Brandon St. M. Co.	165 30
Eureka	1,046 05
Total	$2,790 82
$\frac{1}{5}$ of $2,790.82 is	$558 16

And for Dec. the receipts were:

P., G. & Dewey	$1,275 21
Trojan	231 41
Eureka	260 70
Total	$2,325 48

The amount, therefore, to be deducted for November and December cuttings should be	$2,325 48
To this amount should be added item stated in objection second	1,345 53
And item stated in objection third	100 00
Total amount to be deducted	$3,771 01
Total amount receipts, as per Schedule B	$76,457 07
Deducting, as above	3,771 01
Gross cutting receipts	$72,686 06
" " " as per def't's statement	72,389 01
Differences	$297 05

Fifth objection. The defendant objects to the master's finding that by the removal of the device described in the second claim of the Leschot reissue in question the defendant's drill bit was not equally effective as with it and was not in many respects better for the purposes of defendant, and that by the removal of the diamonds from defendant's drill corresponding with Leschot's diamonds *a'* defendant had not practically demonstrated that the invention set up in the second claim in question was in reality of no value, and that if the device in question could in fact be used or dispensed with equally well because this fact was unknown before the decree in this cause was entered the complainants were in equity entitled to the profits which defendant may have made from using a tool having the diamonds *a'*.

Sixth objection. The defendant objects that the master, as appears from his proposed report, has been governed at all, in passing upon the proofs before him, by a decree entered in another cause and between other parties in this circuit, where a different construction was given to the Leschot patent from that given to the same patent by this court, and where it was held that the defendants did not infringe the "second claim" of said patent.

257 Seventh objection. The defendant objects to the master's conclusion not to rely upon but to reject the defendant's statement, Exhibit B, for what it purports to be, to wit, a compilation from the defendant's books of all the receipts and all the disbursements which belong to the business under investigation. Fortified by the books and evidence, Exhibit B is entitled to absolute credit until it has been discredited by competent evidence, subject also to

correction of errors. Exhibit B was produced on application of complainants. The accountant who prepared Exhibit B has, at complainant's request, been produced and examined under oath as to the exhibit.

He has shown himself to be a skilled accountant, and to have been thorough in his examination of the books in question, and always ready of his own motion to correct errors in the account as well when they were against as when in favor of the defendant. He has been examined in detail as to the items in Exhibit B, and has verified them, and the account supported by this testimony cannot be discredited, except as errors can be specifically pointed out in the account.

Eighth objection. The defendant objects to the master's conclusion to reject defendant's classified statements, marked Defendant's Exhibits Nos. 1, 2, 3, and 4, May 25, 1881.

Exhibit 1 is a full and corrected statement of defendant's cutting receipts. Exhibit 2 is a compilation of the expenses of cutting, so far as those expenses can be traced to particular quarries. Exhibit 3 is a summary statement relating to cutting receipts and expenses. Exhibit 4 is a classified statement of expenses of cutting that could not be traced to particular quarries, and is verified by the accountant who prepared it, and by the books of defendant before the master, and by vouchers subsequently produced before the master.

Ninth objection. The defendant objects to the conclusion of the master that the defendant has abandoned the statements last referred to. On the contrary, the defendant believes and insists that said statements are in entire harmony with the books and vouchers produced and are entitled to full credit, except in so far as they may have been corrected and made more complete by further investigation.

Tenth objection. The defendant objects to the master's conclusion that Defendant's Exhibit 4 is upon the evidence uncertain as to many or any of its items, and particularly uncertain as to the column headed general bills. On the contrary, the defendant insists and requests the master to find that said Exhibit 4, including the column
headed general bills, is sustained by the books, vouchers, and
258 testimony taken before the master, and is not in any way contradicted or impeached by evidence of any kind.

Eleventh objection. The defendant objects to the master's conclusion that defendant's statement, Exhibit X, is not entitled to credit in this accounting, for the reasons stated by the master or for any other reason, and the defendant requests the master to find that Defendant's Exhibit X, sustained as it is by the books, vouchers, and testimony, is entitled to full credit as to each and all of its details on this accounting.

Twelfth objection. The defendant objects to the mode adopted by the master of ascertaining the cost of defendant's contract work—

1st. Because it is not within the province of the master to make up the defendant's accounts in the way adopted by him. He is to take the account of defendant and pass in detail upon the items objected to by complainants, sustaining or overruling such objections.

2nd. Because, if objections are taken to items of the account produced, defendant is entitled to know the specific objections, and then defendant should have the opportunity to furnish evidence touching the subject-matter of such objections. The master has cut off the defendant from this right; and,

3rd. Because it does not purport to be made from all, but a part only, of the books before the master, and is therefore on its face imperfect and incomplete.

Thirteenth objection. The defendant objects to the master's conclusion that the account headed "stone machine No. 1" is an account that relates to defendant's contract work. This account forms no part of the accounts produced by defendant, and has nowhere been mentioned in any testimony taken before the master, and defendant has not been called upon to state or to explain said account.

If not in the accounts produced and verified by defendant it is to be presumed it was omitted for good and sufficient reasons.

Fourteenth objection. The defendant specifically objects to the master's statement headed "Parker, Wilson & Dewey consignment," in Schedule C, because it omits the following items contained in sheet No. 7 D of Defendant's Exhibit X, and proven by the books and vouchers and testimony before the master to belong properly in that statement as part of cutting expenses in question, to wit:

(*a.*)	Item in journal, p. 261, under date June, 1872, sundries furnished by P., G. & D., omitted from statement	$115	00
259 (*b.*)	Items, machine-shop supplies, entered blotter July, 1872	7	00
(*c.*)	Item, do. "	15	00
	(See printed selections, fol. 781 and '2.)		
(*d.*)	Item from old bill book, p. 109, for coal (Dec., 1872)	78	93
	(See printed selections, fol. 783.)		
(*e.*)	1873, May, item in journal, p. 337, labor paid by them	71	36
	(See printed selections, fol. 783.)		
(*f.*)	Aug. Item, " " 785	67	25
(*g.*)	Sept. " " " 786	78	24
(*h.*)	Nov. " (see journal, 384)	5	75

Fifteenth objection. The defendant specifically objects to the master's statement headed "Sutherland Falls Marble Co. consignment," Schedule C, because it omits the following items contained in Defendant's Exhibit X (see sheets No. 7 E and F), the same being proven to be part of cutting expenses at that quarry, to wit:

(*a.*)	1872, July	(see printed sel., fol. 787, &c.)	$19	40
(*b.*)	" Sept.	(" " " 781 & 771)	71	50
(*c.*)	" "	(" " " 788, &c.)	65	99
(*d.*)	" Dec.	(" " " 783, &c.)	85	47
(*e.*)	1873, July	(" " " 789, &c.)	89	78
(*f.*)	" Aug.	(" " " 789, &c.)	23	23
(*g.*)	" Sept.	(" " " 789, &c.)	19	30
(*h.*)	" Nov.	(" " " 790, &c.)	49	30
(*i.*)	" Dec.	(" " " 791, &c.)	18	25
(*j.*)	1874, M'ch	(" " " 792, &c.)	38	30

Sixteenth objection. The defendant specifically objects to the master's statement headed "Sheldon & Slason consignment" in Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet No. 7 A, the same being proven to be part of the cutting expenses at said quarry during the accounting period, to wit:

(*a.*)	Item, Sept., '73 (see printed selections, fol. 769)	$500
(*b.*)	Item, May, '74 (see printed selections, fol. 769)	152 51

Seventeenth objection. The defendant specifically objects to the master's statement headed "Wheaton Quarry consignment" in Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet No. 7 G, the same having been proven to be part of the cutting expenses at said quarry during the period in question, to wit:

(*a.*)	Item, 1872, May (see printed selections, fol. 797, and machine-shop blotter, p. 28)	$42 23
260 (*b.*)	Item, 1872, May (see printed sel., fol. 798)	58 33
(*c.*)	Item, 1872, Oct. (see printed sel., fol. 798)	100 00

Eighteenth objection. The defendant specifically objects to the master's statement headed "Eastern Marble Co. consignment" in Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet No. 7 A, the same having been proven to be part of the cutting expenses of said quarry during the period in question, to wit:

(*a.*)	Item,	Aug.,	'72	(see print. sel.,	fol. 771)	$52 00
(*b.*)	"	Sept.,	"	"	"	25 00

Nineteenth objection. The defendant specifically objects to the master's statement headed "Pittsford Marble Company consignment," Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet No. 7 F, the same having been proven to be part of the cutting expenses at said quarry during the period in question, to wit:

(*a.*)	Item,	July,	'72	(see print.	sel., fol.	792)	$20 10
(*b.*)	"	Aug.,	"	"	"	730	306 72
(*c.*)	"	"	"	"	"	734	260 00
(*d.*)	"	"	"	"	"	793	130 66
(*e.*)	"	"	"	"	"	"	65 66
(*f.*)	"	Sept.,	"	"	"	"	59 94
(*g.*)	"	Nov.,	"	"	"	794	187 48
(*h.*)	"	June,	'73	"	"	"	62 40
(*i.*)	"	Aug.,	"	"	"	796	64 80
(*j.*)	"	Dec.,	"	"	"	795	51 70
(*k.*)	"	Feb'y,	'74	"	"	796	30 00

Twentieth objection. The defendant specifically objects to the master's statement headed "Brandon Statuary Marble Company consignment," Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet No. 7 B, the same having been proven to be part of the cutting expenses at said quarry during the period in question, to wit:

(*a.*)	Item, Sept., '72 (see print. sel., fol. 771)	$72 12
(*b.*)	" Dec., " " " 772	227 57
(*c.*)	" " " " " "	105 63

Twenty-first objection. The defendant specifically objects to the master's statement headed "Eureka Marble Company consignment" in Schedule C, because it omits the following items contained in Defendant's Exhibit X, sheet 7 C, the same having been proven to be part of the cutting expenses at said quarry during the period in question, to wit:

261 (*a.*)	Items, May, '72 (see print. sel., fol. 777)	$5 00
(*b.*)	" Oct., " " " 779	3 90
(*c.*)	Items, Oct., '72 (see print. sel., fol. 779)	72 06
(*d.*)	" " " " " "	72 42
(*e.*)	" Feb'y, '74 " " 780	83 70
(*f.*)	" May, " " " "	28 90
(*g.*)	" Aug., " " " "	13 40
	Admitted by complainants:	
(*h.*)	" Nov. (see print. sel., fol. 780)	362 16

Twenty-second objection. The defendant specifically objects to the Master's Schedule C, because it wholly omits therefrom the statement of cutting expenses contained in Defendant's Exhibit X, sheet 7 B, under the head of Gilson, Clement and Woodfin, incurred and paid during the months of May to November, inclusive, 1874, and amounting in the aggregate to $347.95, the fourth item in said statement being admitted by complainants. (See printed sel., p. 255; and as to the remaining items see printed sel., fols. 773 to 775.)

Twenty-third objection. The defendant specifically objects to the Master's Schedule C, because it omits therefrom the item contained in Defendant's Exhibit X, No. 7 B, a cutting expense, headed Sherman, Adams and Williams, of date June, '74, $17.10. (See journal, p. 435, and printed sel., fol. 775.)

Twenty-fourth objection. The defendant further objects to the Master's Schedule C, because it omits the items contained in Defendant's Exhibit X, sheet No. 7 B, cutting expenses for the years 1873 and 1874, headed Rutland Marble Company, as follows:

(*a.*)	1874, Feb'y, journal, 404	$20 50
(*b.*)	" May, " 428	37 50
(*c.*)	" Nov., " 461	5 72

(See printed sel., fols. 776 and 777.)

Twenty-fifth objection. The defendant further objects to the Master's Schedule C, because it omits the items contained in Defendant's

Exhibit X, sheet No. 7 E, cutting expenses for the year 1873, headed " W. W. Kelly," as follows:

July, '73, journal, 346 (in Case ac.)	$159 05
" " 376 "	155 56

(See printed sel., fols. 786 and 787.)

Twenty-sixth objection. The defendant further objects to the Master's Schedule C, because it omits the item contained in Defendant's Exhibit X, sheet No. 7 F, a cutting expense, headed D. L. Kent & Co., as follows:

262 April, '74, journal, page 421 (see printed sel., fol. 792) $20 25

Twenty-seventh objection. The defendant further objects to the Master's Schedule B, because it omits the items shown on sheet No. 3 of Defendant's Exhibit X, headed " D. F. Esty," part of cutting expenses, and amounting in the aggregate to $745, established by vouchers produced and by testimony. (See printed sel., fols. 707, 708, and 709.)

Twenty-eighth objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheets No. 5 A and 5 B of Defendant's Exhibit X for machine-shop supplies, testified to (see printed sel., fols. 720 to 725, inclusive), to wit:

(*a.*)	Items, Aug., '72	$112 00
(*b.*)	" April, '73	160 68
(*c.*)	" May, "	162 06
(*d.*)	" June, "	208 53
(*e.*)	" July, "	344 24
(*f.*)	" Aug., "	171 00
(*g.*)	" Sept., "	351 39
(*h.*)	" Oct., "	217 23
(*i.*)	" Nov., "	2 96
(*j.*)	" Dec., "	213 07
(*k.*)	" M'ch, '74	163 41
(*l.*)	" April, "	580 12
(*m.*)	" May, "	273 30

Twenty-ninth objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheet No. 6 A of Defendant's Exhibit X, headed " Travelling expenses " (see printed sel., fols. 725 to 728, inclusive, to wit):

(*a.*)	Items, Jan'y, '72	$14 30
(*b.*)	" " "	21 65
(*c.*)	" " "	7 65
(*d.*)	" Feb'y, "	11 30
(*e.*)	" M'ch, "	14 85
(*f.*)	" May, "	25 05
(*g.*)	" June, "	17 90
(*h.*)	" Oct., "	14 15
(*i.*)	" Nov., "	105 30
(*j.*)	" " "	124 92

(*k.*)	Items, June, '71	$10 00
(*l.*)	" Dec., "	21 50
(*m.*)	" " "	15 55
(*n.*)	" Jan'y, '73	249 93
(*o.*)	" Aug., "	56 60
(*p.*)	" Nov., "	22 40
(*q.*)	" Jan'y, '74	21 90
(*r.*)	Items, M'ch, '74	51 33
263 (*s.*)	" Ap'l, '74	123 63
(*t.*)	" May, "	55 65
(*u.*)	Items, Oct., '74	94 65
(*v.*)	" Dec., "	59 77

Thirtieth objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheet No. 6 B in Defendant's Exhibit X, being payments to or through "P. P. Story," to wit:

(*a.*)	April, '72 (prin'd sel., fol. 730)	$243 66
(*b.*)	Dec., '73 (prin'd sel., fol. 740)	500 00
(*c.*)	" " "	63 65
(*d.*)	July, '74 (J., p. 442, and print. sel., fol. 746)	375 55
(*e.*)	Oct., '72 (print. sel., fol. 734)	348 75

Thirty-first objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheet No. 6 C in Defendant's Exhibit X, being payments for coal, to wit:

(*a.*)	Item, June, '73, (print. sel., fol. 747)	$653 57
(*b.*)	" " " 748	544 56
(*c.*)	" Aug., " " "	75 62
(*d.*)	" Oct., " " 749	299 37
(*e*)	" Nov., " " "	177 26
(*f.*)	" " '74, " 753	170 53

Thirty-second objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheet No. 6 D in Defendant's Exhibit X, representing various cutting expenses, to wit:

(*a.*)	Sept., '72 (print. sel., fol. 756)	$78 29
(*b.*)	Ap'l, '73 " " 754	28 70
(*c.*)	July, " " " 757	86 32
(*d.*)	Aug., " " " "	7 04
(*e.*)	Oct., " " " "	137 36
(*f.*)	" " " " "	26 20
(*g.*)	M'ch, '74 " " 769	30 00

Thirty-third objection. The defendant further objects to the Master's Schedule C, because it omits the following items shown on sheet No. 6 E of Defendant's Exhibit X, which represent cutting expenses in question, to wit:

(*a.*) Item, June, '74 (print. sel., fol. 759)	$11	12
(*b.*) " Aug., " " " "	95	32
(*c.*) " Oct., " " " "	14	10
(*d.*) " Nov., " " " 760	64	01
(*e.*) Also items, '72 (machine-shop supplies, Esty)	224	62
(*f.*) Item, June, '72 (machine labor, Esty; prin. sel., F. 761)	11	90
264 (*g.*) 1872, carbons used	2,392	85
(*h.*) 1873, "	4,629	68
(*i.*) 1874	3,204	23

(See, as to the carbons, prin. sel., fols. 659, 685, 686, 687, 762.)

Thirty-fourth objection. The defendant objects to the finding of the master, upon the evidence before him, that defendant's diamond-drill business during the accounting period was not an experimental business, expensive, and unremunerative, but was a source of profit to defendant and not of loss.

Thirty-fifth objection. The defendant objects to the master's finding that defendant's machine did not depreciate by use and wear during the accounting period, and because he has allowed nothing for such depreciation.

Thirty-sixth objection. The defendant objects to the master's finding that the defendant's net receipts of profits realized from his cutting business amounted to $8,158.42, or any part of that sum.

Thirty-seventh objection. The defendant objects to the master's finding that the burden of proof was not upon the complainants to show the value of the diamonds *a′* in defendant's machine and the share of profits, if any, which equitably belonged to the complainants' device *a′*.

Thirty-eighth objection. The defendant objects to the master's finding that Leschot invented a new rock-boring tool and not a mere improvement in rock-boring tools.

Thirty-ninth objection. The defendant objects to the conclusion of the master that because the defendant had not applied the infringing device to an existing mechanism, but had used it in combination with a newly organized mechanism designed to accomplish a class of work to which the alleged infringing device had not been before applied, the burden of proof was shifted from complainants to defendant to distribute the profits arising from the various inventions embodied in defendant's machine, with a view to reaching the value of defendant's device in such machine.

Fortieth objection. The defendant objects to the finding of the master that the proofs before him do not establish that the infringing device in question in defendant's machine was without value or advantage.

265 Forty-first objection. The defendant objects to the finding of the master that defendant's novel and patented devices and combinations in respect to engine, frames, mounting, feed, and reversing mechanisms, track, and spacing in the machines manufactured by defendant did not involve any vital invention, and that defendant is not entitled to special allowance on account of them.

Forty-second objection. The defendant objects to the finding of the master that there is from the evidence no way of determining the relative advantage of the Leschot core bit and defendant's conical bit, when it appears by proof that the owners of the Leschot patent who had full knowledge of the unsuccessful experiments made in or about the year 1868 at channel cutting and gadding allowed their patent to expire without attempting to demonstate that the core bit could be successfully applied to the work named.

Forty-third objection. The defendant objects to the master's finding that the cost of defendant's machines is to be reached by estimates rather than by the account B and the books and other statements of accounts before the master with the proofs relating to the same.

The account B shows all the disbursements of defendant during the accounting period belonging to defendant's diamond-drill business, as well as all the receipts.

By defendant's statements, subsequently prepared, the cutting expenses have been separated from the construction expenses.

The actual construction cost of the machines can thus be accurately reached by deducting the cutting disbursements from the aggregate disbursements.

Forty-fourth objection. The defendant objects to the finding of the master that nothing should be allowed to the defendant from the profits, if any, from the sale of its machines on account of the patented inventions of defendant or the general mechanism which it has used in organizing the machines in question.

Forty-fifth objection. The defendant objects to the finding of the master that the complainant's claim should not be limited to the drill bits and rods, but should embrace the entire machine.

Forty-sixth objection. The defendant objects to the findings of the master that the gains, profits, and advantages which defendant received from the presence of the Leschot invention on the machines which they made and sold from June 1, 1871, to November 24, 1874, amounted to $10,009.45 or to any part of said sum.

E. T. RICE,
Of Counsel for Def't.

266 The master, having fully considered the foregoing objections and requests, rules upon them as follows:

Rulings on Complainants' Objections.

Objections 1, 6, and 18:

These relate to the master's allowance to defendants of $9,571.50 on account of "general expenses" as a part of the cost of the contract channeling done by defendants and to the corresponding allowance by him of $9,349.50 on account of machines sold.

Ball's estimates of the cost of building the machines, as expressly set forth by him in the written statements which he presents and upon which the master has relied in determining such cost, do not include what are properly denominated general expenses. It seems equitable that defendants should have an allowance on this account. While it is true that Rice's statement of the aggregate general expenses of the Sullivan Company is not supported by vouchers, yet it is the best if not the only means presented by the evidence for ascertaining such expenses, and his estimates seem on the whole reasonable.

There seems no good reason why defendants' contract work (the cost of which was made up largely of coal and labor bills, entered in the books at their exact amounts) should not be credited with a due proportion of the general expenses, and no better way of apportioning these expenses has occurred to the master, after mature deliberation, than that adopted in the preliminary report. The objections are overruled.

267 Objection 7:

The evidence does not seem to the master to establish that Ball's estimates of cost include ten per centum as manufacturer's profits any more than that they include the proper share of the general expenses.

Objections 2, 13, 14, and 15:

These relate to the account with G. F. Case. The testimony of Upham and of Rice seems to establish conclusively that this account related to the contract channeling; that the contract with Case in 1873, to do the work for defendants at 27 cents a foot, was purely experimental; that when he gave it up the defendants did not call upon him to refund the $6,268.95, being the excess of moneys and supplies furnished him over the price of his work at 27 cents a foot, and that the amount has, in fact, never been collected from him. The master deems himself justified in treating the entire Case account as was done by the Sullivan Machine Co. at the time (as shown by their ledger accounts), viz., as representing expenses connecting with defendants' contract cutting. The objections are overruled.

Objections 3 and 8:

In these interest from the date of the interlocutory decree is claimed on defendants' profits from the sales of machines and from contract cutting. The request therefor is not allowed.

Objections 4, 5, and 10:

These relate to the machines sold to the Brandon Stat. Mar. Co. and to J. B. Hollister. C. B. Rice testifies that the Brandon Co. "became insolvent," nothing having been paid on their machine, and that the $1,800 unpaid on the Hollister machine is a "bad debt." In a general accounting it would seem that the defendants should have credit for the cost of these machines, and, under
268 the circumstances, it would seem inequitable to charge them with more than they have actually received from the sales. There seems no reason to suppose that they will ever receive more for these machines than the master has already charged them with. The objections are overruled.

Objection 9:

Exhibit A, put in evidence before the former master, was produced before the present master by the complainants. It seems to include all the drill heads furnished with defendants' machines as sold. The claim made in the objection that repairs to these heads took on the form of making new heads, which constituted new infringements, does not seem established by the evidence.

Objections 11, 12, 19, 24, and 25:

These relate to the statements of conclusions merely, and proceed upon what the master deems incorrect premises.

Objection 16:

The master believes that he has adopted the correct theory as to the "consignment, supply, and expense" account as set forth in the preliminary report. The objection is overruled.

Objection 17:

Overruled as indefinite.

Objection 20:

The master adheres to his views of the value of complainants' special experiment with a core drill, as expressed in his preliminary report.

Objections 21 and 23:

The master adheres to his views in regard to the estimates presented by complainants as to the cost of the channeling done by defendants and the cost of their machines.

Objection 22:

It is believed that the average performance of a channeler
269 in the quarries is considerably below 40 feet per day. In the
year 1873 defendants, with their seven machines, in nine months cut only about 45,580 channel feet (see Schedule B, *supra*), being about 6,512 feet to each machine, or, on an average, about 30 feet per day for each working day of the nine months. The conditions of a quarry are such that a channeler can seldom be worked up to its full capacity.

Objections 26 and 27:

It still seems to the master that the weight of evidence is largely in favor of the solid-headed drill bit for channeling, and he fails to find in the evidence proof that complainants' machines as built could successfully compete, either for channeling or for gadding, with other machines used for those purposes.

Objection 28:

The master still fails to find any evidence of an established license fee by complainants applicable to the present case.

Objections 29 and 30:

The master still holds that defendants' machines fell far short of supplying the entire available field for this class of machines.

Objection 31:

The master holds that the apparently exceptional use of a machine in 1880, as referred to in this objection, cannot form a basis for the calculation of the profits made by defendants in 1872–'4 under the then prevailing conditions.

Rulings on Defendants' Objections.

Objection 1:

This relates to the phraseology of the preliminary report upon a point of no materiality.

270 Objections 2, 3, and 13:

These objections have relation to two items of $1,345.53 and $100 with which the preliminary report, in Schedule B, charges the defendants on account of moneys received for cutting done respectively at the Sutherland Falls quarry and the Brandon quarry, as also to the entire account "stone machine No. 1" in the Master's Schedule C. The gist of the objection is that stone machine No. 1 was not owned by the defendants, but by one Love; that the work for which the above-named amounts were charged was done with this machine, and therefore that defendants should neither be charged therefor nor credited (as by the "stone machine No. 1" account) with the expenses incurred in running the machine.

Defendants' counsel asserts that the entries in the journal upon which the master relied in making up the accounts which include the items objected to are explained by subsequent entries. However this may be, complainants now admit by counsel that they do not claim the $1,345.53 nor the $100.00. The master therefore in modifying his preliminary report allows these amounts to the defendants, at the same time charging them with the $1,149.53, the cost of operating the machine, as stated in "stone machine No. 1" account, and for which in the preliminary report he gave them credit.

Objection 4:

This objection involves an erroneous calculation and is overruled.

Objections 5 and 6:

These relate to the question of profits as affected by the relative efficiency of projecting and flush diamonds. The master's position (not stated with entire accuracy in the fifth objection) is that if flush diamonds are equally efficient with the diamonds *a′ a′*
271 of the patent defendants cannot avail of such fact to establish a diminution of profits, since the fact was not known until after the accounting period.

As to the decision in American Diamond Rock Boring Co. *vs.* Sheldon, the master, in drawing his preliminary report, was under the impression (derived from reading the report of the case in 17 Blatch., 208) that the court found infringement of the second as well as of the third claim. Statement is now made that the decree adjudges infringement of the third claim only. This fact, however, does not affect the master's views as to the real point involved in the fifth and sixth objections, which are overruled.

Objections 7 and 43:

These relate to defendants' statement of account, "Exhibit B," which it is claimed should be adopted. The objections are overruled and the requests denied. Not only is the statement not what was called for in the master's order, but it would seem impossible, even upon defendants' theory of the statement, to distribute properly the items composing it between the period of the accounting and the periods immediately before and afterwards.

Objections 8, 9, and 10:

These relate to defendants' classified statement of cutting receipts and expenses produced May 25, 1881. The statement subsequently produced by the defendants and marked "Exhibit X" (or "C. B. Rice's Cutting Account, October 26, 1881") was produced by them as a more perfect classification, with alleged correction of errors, of the matters to which the accounts of May 25, 1881. related. For this reason the master considered and still considers Exhibit X as substituted for the earlier account, and deems himself relieved from the further consideration of the latter.

272 Objection 12:

Overruled.

Objections 11 and 14 to 33:

These have relation to defendants' statement of cutting expenses on contract work marked "Exhibit X." In objection 11 the master is asked, in general terms, to find that Exhibit X is reliable and entitled to full credit, and objections 14 to 33 specify numerous items contained in Exhibit X which it is claimed are omitted from but should be included in the master's statement of defendants' cutting expenses.

The master, for reasons stated in the preliminary report, cannot regard Exhibit X as entitled to the credit claimed for it, and overrules objection 11. The other objections are treated in detail as follows:

Objection 14:

Item (*a*) is not shown to be connected with the contract work.

Items (*b*) and (*c*) are already included in the $28.25 for which defendants have received credit in the Parker, Gilson & Dewey cons'g't account. (See Journal, 268, and day book, 459.)

Item (*d*) is included in the item $164.40 already in the consignment, supply, and expense account.

Items (*e*), (*f*), (*g*), and (*h*) are in the Case account—item (*f*) as a part of the entry $95.48, and item (*h*) as a part of the entry $55.05—and consequently due weight has been given them in the general consig't, sup., and exp. account, to which the balance of the Case account was transferred by the master, as explained in his preliminary report.

The objection is overruled.

Objection 15:

It is understood that defendants' counsel, after fuller examination, concedes that all these items, except (*a*), are already included in some form in the master's general cons'gn't, sup., and exp. account. Such the master finds to be the case.

273 As to item (*a*) there seems no warrant for the amount $19.40. The correct item, as appears in the journal, p. 268, is $15.02, and this has been included in the Suth. Falls con'gn't account. The objection is overruled.

Objection 16:
This is understood to be withdrawn.

Objection 17:
Item (*a*). Not shown to connect with contract work.
Item (*b*). The journal entry on page 260 relating to this item is as follows:

“D. F. Esty, dr., to Wheaton Marble Co.—expenses as per statement—April and May, '72	58 35”

Defendants' theory about this and the other items relating to Esty, *infra*, is that the contract work in the Wheaton and the Pittsford quarries was sublet to him, by way of experiment, at twenty cents per channel foot; that, after a limited trial, he failed in the undertaking, and the defendants thereupon assumed the entire expenses of the work from the start, and therefore that they should have credit in this accounting for all the supplies furnished to and moneys expended by or on account of Esty, including, by way of example, the $58.35 paid out, as per above journal entry, by the Wheaton Company on account of the expenses of the cutting which Esty was doing.

Defendants' premises do not seem established. On the contrary, on journal page 302, under date of Dec. 31, 1872, appears this entry:

“Sundries, dr., to D. F. Esty	$1,638 60
W. M. Co. cons'g't ac., 5,747 ft. @ 20 ct.	1,149 40
P. M. Q'y cons'g't ac., 2,446 ft. @ 20 ct.	489 20
To Aug. 31, per contract.”	

274 This entry, taken in connection with various journal entries showing Esty as charged with the moneys advanced to him by the Sullivan Machine Company and by the quarries where he was at work, and with the supplies which he received from the Sullivan Company and elsewhere, would seem to show that down to August 31, 1872 (prior to which the various charges against him occur), the contract with Esty was still subsisting. Upon this assumption the master, in making up his table, Schedule C, has given the defendants credit for the $1,149.40 allowed Esty for cutting done by him in the Wheaton Company's quarry and for the $489.20 allowed him for cutting in the Pittsford quarry. Whether this cutting actually cost more or less than this is not shown. Manifestly the defendants should not receive further credits on this account unless it be shown, first, that this cutting did cost more than these amounts; and, secondly, that the Sullivan Company undertook to make up his losses to Esty. Neither of these things appearing, item (*b*), $58.35, and all similar items must be disallowed.

Item (*c*). In support of this item ($100) defendants refer to machine-shop blotter, p. 90, and day book, p. 491. The entries there found are not understood. The journal, at p. 291, where the daybook entry is journalized, charges the Wheaton Q'y cons'g't account with $72.00. This the master has already incorporated in his Schedule C.

Objection 18:

Item (*a*). This item of $52.00 seems to have been wages paid to one Staples on account of the Sullivan Mach. Co.'s contract work, and defendant should have credit therefor.

Item (*b*). This item of same amount is of the same character.

Both items are allowed.

275 Objection 19:

Items (*a*), (*b*), (*c*), (*d*), and (*e*), on analysis, are found to relate to supplies furnished to Esty or to cash paid him or his men. For reasons stated under objection 17 these items are disallowed.

Item (*f*). Already included in the $416.47 of the general consig't, sup., and exp. account. (See J., 285.)

Items (*g*), (*h*), (*i*), and (*j*) are all included in some form in the cons'g't, sup., and ex. account, as is now conceded by defendants' counsel.

Item (*k*). The Pittsford bill No. 7 does not seem to connect this item with the contract work.

The objection is overruled.

Objection 20:

Item (*a*). The amount is already included in the $416.47 of the cons'g't, sup., and exp. account. (See J., 285.)

Item (*b*). An examination of the Brandon Stat. Mar. Co.'s bill No. 1 (which is a statement of all contract work done for the company by the defendants and of the disbursements made by the company on account of the defendants) shows that this item ($227.57) should be allowed.

Item (*c*). Already included in Case account and thus in cons'g't, sup. and ex. account.

Objection 21:

Items (*a*) to (*g*) are found, upon examination (defendants' counsel conceding it), to be already included in the appropriate consignment accounts, whereby defendants have received proper credit.

Item (*h*). The entry in journal at page 484 shows an allowance to the Eureka Marble Co. for damage to marble of $362.16. The item should be allowed defendants.

276 Objection 22:

Understood to be withdrawn, except as to two items of $27.97 & $52.30. These are both found in the cons'g't, sup., ex. acc't, as already made up. The objection is overruled.

Objection 23:

Has been withdrawn since filing.

Objection 24:

Item (*a*). Not shown to connect with the contract work and disallowed.

Items (*b*) & (*c*). Conceded by defendants' counsel to be already included in cons'g't, sup., and ex. acc't.

Objection 25:
Withdrawn; items in c., s., & ex. acc't.

Objection 26:
Withdrawn; items in c., s., & ex. acc't.

Objection 27:
Relates to D. F. Esty. For reasons given under objection 17 it is disallowed.

Objection 28:
Withdrawn; items already in c., s., and ex. acc't.

Objection 29:
The several items enumerated amount to $1,140.15. The bills referred to to support the items show that they relate to the visits of Upham and Ball to the vicinity where defendants' machines were at work. It seems fair to assume that these visits had relation mainly to the contract channeling, but as, with one or two exceptions, the journal has not treated these expenses as chargeable to any of the so-called "assignment accounts," it may be assumed that they were reckoned as "general expenses" of the Sullivan Mach Co. and thus must have been included in Mr. Rice's statement of general expenses. As the master has already given the defendants the benefit of a *pro rata* amount of these general expenses, on a basis explained in the preliminary report, such allowance must be held to include the claim now made, which accordingly is overruled.

277 Objection 30:
Item (*a*). This item of $243.66 is found, on reference to Story memo. No. 3 and to cash book 141, to consist of three items—$197.16, which Story paid to Willson for coal; $39.60, for freight, &c., on contract machines in Eureka Co.'s quarry; and $6.90, repairs on boiler at the Brandon Co.'s quarry. The last two items have already been credited to the defendants by entries in the Eureka and the Brandon cons'g't accounts. It is thought that the first item ($197.16) has not been so credited in any form. It should be, however, and to that extent the objection is sustained.

Items (*b*) and (*c*) are found in Case ac.; so admitted by defendants' counsel.

Item (*d*). Overruled. This item is included in and forms part of the $402.45 already in the cons'g't, sup., and ex. acc't. (See J., 435.)

Item (*e*). Story memo. No. 6 and two entries on journal page 286 show that this $348.75 was paid to Willson for coal. It must have been on account of contract cutting. It should be allowed.

Objection 31:
Items (*a*) to (*d*), inclusive, are embraced in the Case acc't, and thus are incorporated in the cons'g't, sup., and ex. acc't. This is now conceded by defendants' counsel.

Item (*e*). It is conceded that this item relates to the time subsequent to the close of the accounting period.

Item (*f*). This is already in the cons'g't, sup., and ex. acc't.

The objection is overruled.

Objection 32:

Item (*a*). Does not seem to connect with the contract cutting.

278 Item (*b*). This item ($28.70) for "repairing upright boiler" seems to have had to do with a machine used on contract work. It should be allowed.

Item (*c*). Already included in cons'g't, sup., and ex. acc't.

Item (*d*). Does not seem to connect with contract cutting.

Items (*e*) and (*f*). These two amounts ($137.36 and $26.30) were paid out for "piping, valves, fittings, unions," &c. (see cash book, 189, and old bill book, 133), and seem to have been paid on account of the contract cutting. They should be allowed.

Item (*g*). A part of the $125.32 already included in the cons'g't, sup., and ex. acc't. (See, also, journal, p. 479.)

Objection 33:

Item (*a*). This amount ($11.12) probably was for repairing done on the machines on contract work. It should be allowed.

Item (*b*). A part of the $125.32 already included in the cons'g't, sup., and ex. acc't.

Item (*c*). Already in cons'g't, sup., and ex. acc't, and this defendants' counsel admit.

Item (*d*). A comparison of the Mansfield and Stimpson bill No. 1 and journal entry on p. 515 shows that the amount included in the bill ($71.51) had to do with the contract cutting. Deducting the last two items as not within the accounting period, the defendants are entitled to credit for the balance, $61.76.

Items (*e*) and (*f*). These have to do with D. F. Esty's contract, and for reasons set forth under objection 17 must be disallowed.

Items (*g*) to (*i*). These relate to the carbons alleged to have been used in repairing the contract machines during the years 1872, '3, and '4, and are understood to include the total value of the
279 carbons which, Mr. Ball testifies, were used for the purposes specified. The master is of the opinion that Mr. Ball, who testified without having his carbon book before him, was in error in giving the amounts of carbons used in repairing these machines. For instance, he states that in the year 1873 $540\frac{7}{8}$ carats were so used. An examination of the day book (made somewhat hurriedly, and therefore not claiming extreme accuracy) shows that the defendants used that year about 597 carats, of which only $278\frac{1}{4}$ carats are charged to Case, while the others are charged up to various quarries where machines were owned and to construction account—the Rutland Mar. Co. being charged with $134\frac{7}{8}$ carats, the Columbian Co. with $15\frac{15}{16}$, the Brandon Co. with $3\frac{7}{16}$, the Eureka Co. with $2\frac{5}{16}$, the Suth. Falls Co. with $1\frac{1}{2}$, Hollister, $13\frac{5}{16}$, Connolly with $3\frac{5}{8}$, Clement with 14, Friedley with $14\frac{7}{8}$, Sheldon & Season with $1\frac{3}{4}$, P. G. & D. with 8, Sherman, A. & W., with $9\frac{1}{8}$, construction ac. with $4\frac{1}{2}$, and

consignment ac. with 89⅜ carats. Many of these day-book entries were journalized in a similar manner, and corresponding entries appear to have been made in the ledger. The only legitimate inference from this is that the carbons thus charged to specific quarry companies were used in repairing machines owned by those companies, and cannot be credited to defendants on account of contract cutting; while those charged to Case, in whose name most of the contract work for that year was done, were undoubtedly used in repairing the machines used by him, but for these the defendants have already received proper credit in the cons'g't, sup., and ex. acc't, in which the Case acc't is included in the manner explained in the
preliminary report. In like manner, referring to the year
280 1874, it will be seen that the master has in a single item in
the cons'g't and ex. acc't given defendants credit for $3,057.15
on account of carbons used in connection with the contract work.

The master fails to see that the defendants are entitled to further credits on this account, and the objection, except as to item (*a*), is overruled.

Objection 34:

As defendants' machines, whether made for sale or for use, did not undergo material alterations during the period of the accounting, the master cannot regard the business as "experimental." The objection is overruled.

Objection 35:

The master's refusal to make an allowance for depreciation of defendants' machines by use and wear was based upon the supposition that the repairs for which defendants have received credit have been of a character to maintain the machines at their full working capacity. While the machines after use might not at forced sale bring as high a price as entirely new machines, there appears no good reason to suppose that defendants at the period of the accounting would have sold one of the machines that had been in use for a less price than a new one; and it seems to the master that for defendants' purposes (*i. e.*, for use on contract work) the machines may fairly be regarded at the end of such period as of as much value as when first put at work. In the conflicting evidence relating to depreciation of the machines, the witnesses may not have kept in mind the thorough character of the repairs, including replacement of parts, which defendants probably made.

Objections 36 and 46:

These relate to the master's findings of "net profits" from con-
tract work and from sales, respectively. With the exceptions
281 noted in considering the objections summarized hereafter, the
master adheres to his views as stated in the preliminary re-
port.

Objections 37, 38, and 39:

These relate to the question of the burden of proof in the apportionment of profits. The master adheres to the views expressed in the preliminary report.

Objection 40:
Overruled.

Objections 41 and 44:
In these defendants claim special allowance for the "engines, frames, mounting, feed and reversing mechanisms, track and spacing devices," in their various machines. Overruled for reasons stated in the preliminary report.

Objection 42:
The master's view upon this point is briefly this: That while the weight of evidence seems to be decidedly in favor of the solid conical bit for channeling, yet the defendants are not entitled to benefit by that fact, by way of apportionment of profits, because the burden of proof being upon them, they have failed to show the amount or extent of the superiority of their tool, so as to enable the master to form a judgment as to what their improvement has been worth to them in their business.

Objection 45:
Defendants request the master to limit the complainants' claim to the drill bits and rods. For reasons sufficiently stated in the preliminary report, the master adheres to his former views, including the entire machine in the accounting, and denies the request.

282 Having thus duly considered the objections of both parties, made to the preliminary report, the master now adopts such report, with the several modifications above indicated and summarized hereafter, as his final report.

Modifying the preliminary report in accordance with the foregoing findings, the account will stand as follows:

Machines Used.

Total receipts from cutting as stated in Schedule B of preliminary report		$74,164 65
Deduct allowances made as per defendants' objections:		
Cutting for Suth. F. Mar. Co. (obj'n 2)	$1,345 53	
" " Brandon Co. (obj'n 3)	100 00	
Drawback to Eureka Mar. Co. (obj'n 21)	362 16	
		1,807 69
Receipts from cutting		$72,356 96
Cost of cutting as stated in Schedule C of preliminary report	$56,434 68	
Deduct bal. of stone mach. No. 1 acc't in Sched. C (as per def'ts' obj'n 13)	1,149 53	
	$55,285 15	

Add allowances made as per def'ts' obj'ns:

Am'ts p'd staples (obj'n 18)	$104 00	
Pay'ts by Brandon Co. (obj'n 20)	227 57	
Willson coal bills (obj'n 30)	545 91	
Repairs on boiler (obj'n 32)	28 70	
Piping, valves, etc. (obj'n 32)	163 66	
Repairs (obj'n 33)	11 12	
Mansfield & S. bill (obj'n 33)	61 76	
		1,142 72
		$56,427 87
Add for general expenses on basis adopted in preliminary report, pages 37 and 38		9,454 67

This amount is obtained as follows:

Total general expenses, $43,272.73; aggregate mach. shop labor, $67,048.92; mach. shop labor charged to all branches of the diamond-drill business, $29,330.33. Apportioning these general expenses in the ratio of mach. shop labor, the amount chargeable to diamond drills is $18,921; 283 and apportioning this to the machines used and those sold in the ratio of the respective amounts received from these two sources (viz., $72,356.96 and $72,446.25), the amount chargeable to the cost of cutting is $9,454.67, and the amount chargeable to cost of machines sold is $9,466.33 $65,882 54

Making net profit from cutting $6,474 42

Machines Sold.

Total receipts as per Schedule A of preliminary report		$72,446 25
Cost of same; items embraced in Ball's estimate as stated in preliminary report, page 49	$47,411 23	
Add for general expenses belonging to machines sold as per calculation above	9,466 33	
	$56,877 56	
Add ten per centum, as manufacturers' profits	5,687 75	
Total cost		$62,565 31
Net profits from sales		$9,870 94

If the accounting as to defendants' profits on the machines sold is to be limited to the boring heads and the drill rods (these being the devices specifically named in the 2d and 3d claims of the Leschot patent) a corresponding apportionment of the above amount ($9,870.94) can readily be made as follows:

According to the Ball estimates each two-spindle channeler (of which there were nine sold) cost, exclusive of general expenses and including two boring heads each, $3,095.84, the two heads being estimated by him at $350 ($175 each), and the spindles or drill rods at $80. In like manner the twelve gadders sold are estimated to have cost, not including general expenses, $1,096.44 each, the two
heads being estimated by Ball at $200 ($100 each), and the
284 spindles or drill rods at $30. The two tunneling channelers,
in like manner, are estimated to have cost $2,559.36 each, the three boring heads of these machines being placed at $525 ($175 each) and the spindles at $80. So, also, the three-spindle drills are estimated in the preliminary report, page 49, to have cost $1,487.84 each; and, upon reference to the statements contained in Exhibit A, the three boring heads may be set down at $225 ($75 each), while the spindles can safely be put at $80.

It also appears from defendants' admissions in Exhibit A that they sold during the accounting period a few boring heads other than the regular allowance for the machines as included in Ball's estimates, viz., five extra heads for channelers, two extra heads for gadders, and two extra heads for three-spindle drills.

The cost of the heads and drill rods sold by defendants (not including allowance for general expenses) will then stand as follows:

9 two-spindle channelers	$3,870
Heads, $350 each machine.	
Spindles, $80 "	
2 two-spindle tunnelers	1,210
Heads, $525 each machine.	
Spindles, $80 "	
2 three-spindle drills	610
Heads, $225 each machine.	
Spindles, $80 "	
12 gadders	2,760
Heads, $200 each machine.	
Spindles, $30 "	
9 extra drill heads	1,225
5 heads at $175.	
2 heads at $100.	
2 heads at $75.	
Total	$9,675

285 As above stated, the aggregate cost of the entire machines
sold was $47,411.23. If the net profits on the entire machines (found above to be $9,870.94) are to be distributed between the drill heads and rods on the one hand and the other parts of the machine

on the other it would seem equitable that this should be done in the ratio of the costs of the respective parts. On this basis the profits apportionable to the boring heads and rods would be two thousand and fourteen dollars and thirty-two cents ($2,014.32). For reasons stated in the preliminary report, however, the master is of the opinion that defendants should account for the entire profits on the machines sold.

The master therefore reports that the "gains, profits, and advantages" arising to the defendants from the use by them of the inventions covered by the second and third claims of the Leschot patent from June 1, 1871, to November 24, 1874, were nine thousand eight hundred and seventy dollars and ninety-four cents ($9,870.94) on machines made and sold, and six thousand four hundred and seventy-four dollars and forty-two cents ($6,474.42) on machines made and used on contract cutting, making an aggregate of $16,345.36; and that there have been no "damages in excess of profits" suffered by the complainants by reason of defendants' manufacture and sale or use of the infringing machines.

Respectfully submitted,

(S'g'd) SAM'L A. DUNCAN,
Special Master.

(Endorsed:) Circuit court of the United States, southern district of New York. American Diamond Drill Company *vs.* Sullivan Machine Company. In equity. Report of S. A. Duncan, special master. U. S. circuit court. Filed Nov. 1, 1883. Timothy Griffith, clerk.

286 Circuit Court of the United States, Southern District of New York. In Equity.

AMERICAN DIAMOND DRILL COMPANY
against
SULLIVAN MACHINE COMPANY.

The complainant comes and excepts to the master's report herein—

First. For that the master has allowed the defendant for general expenses in the machines used in cutting or contract work the sum of $9,454.67, whereas the master should have found that the general expenses of defendant in said work was already included in the cost allowed for the same.

Second. For that the master has allowed the defendant for general expenses in the machines sold the sum of $9,466.33, whereas the master should have found that the general expenses of defendant belonging to machines sold was already included in the cost allowed for the same. 287

Third. For that the master has allowed the defendant-, as manufacturers, profit on machines sold the sum of ten per centum, to wit, $5,687.75, on the estimated cost thereof, whereas the master should have found that the manufacturers' profit was already included in the cost allowed for the same.

Fourth. For that the master has allowed the defendant the cost of a channelling machine sold the Brandon Statuary Marble Company Sept. 30th, 1873, to wit:

The sum of (Ball's estimate, p. 49)	$3,095 84
Proportion of general expenses, $\frac{1}{25}$th	378 64
10 per cent. manufacturers' profit	347 44
	$3,821.92

288 Whereas the master should have found that defendant was not entitled to have any part of the cost of said machine allowed to it.

Fifth. For that the master has allowed the defendant the cost of a 3-spindle drill machine sold J. B. Hollister April 30th, 1873, to wit:

The sum of (Ball's estimate)	$1,487 88
Proportion of general expenses, $\frac{1}{25}$th	378 64
10 per cent. manufacturers' profit	186 65
	$2,052 17

Whereas the master should have found that defendant should have been allowed the sum of $1,000 only.

Sixth. For that the master has not allowed the complainant interest on the profits made by defendant from the sale and use of complainant's invention from the date of the interlocutory decree herein.

(Signed) WETMORE, JENNER & THOMPSON,
For Complainant.

(Endorsed:) U. S. circuit court, southern district of New York. American Diamond Drill Company *vs.* Sullivan Machine 289 Company, complainants. Exceptions to master's report. Wetmore, Jenner & Thompson, for complainant. U. S. circuit court. Filed Nov. 5, 1883. Timothy Griffith, clerk.

290 United States Circuit Court, Southern District of New York.
In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

Exceptions taken by the defendant, The Sullivan Machine Company, to the report of Samuel A. Duncan, Esquire, appointed special master herein by order duly made in this cause, dated February 27, 1877, which said report was filed with the clerk of this court November 1st, 1883.

First exception. Because the said master has in and by his said report overruled the defendant's "fifth objection" to the master's draft report and has found that the complainants are entitled to the

entire profits of the defendant's manufacture, sale, and use of
291 quarrying machines, whereas he should have found, as was requested by defendant, that the proofs before him demonstrated that complainants' diamonds *a'* were without value in defendant's machines, and that for that reason the complainants were in equity not entitled to any part or share of defendant's profits.

Second exception. Because the master overruled the defendant's "sixth objection" to said draft report and based his finding that complainants were entitled to the profits realized by defendants in their manufacture, sale, and use of the device covered by the second claim of the Leschot patent upon the decision in American Diamond Rock Boring Company *vs.* Sheldon and others, when it was obvious that the decree entered in this cause in 1875 was based upon an entirely different construction of the patent in question, from that adopted in the case cited, decided in October, 1879.

292 Third exception. Because the master overruled the defendant's "seventh objection" to said draft report and rejected entirely the defendant's statement of account, Exhibit B, prepared and produced by defendant under the order of the master at complainants' request, whereas the master should have based his findings upon that account and upon the subsequent accounts produced by defendant.

Fourth exception. Because the master overruled the defendant's "eighth objection" to said draft report and rejected entirely defendant's classified statements marked Defendant's Exhibits Nos. 1, 2, 3, and 4 of May 25, 1881, verified by the testimony of the accountant who prepared them and by defendant's books and vouchers before the master, whereas he should in his findings have given credit to said statements.

Fifth objection. Because the master overruled the defendant's "tenth objection" to said draft report and generally found,
293 upon the evidence, the Defendant's Exhibit 4 to be uncertain as to many of its items, and particularly as to the column headed general bills, whereas he should have required specific objections from complainants to details of Exhibit 4.

Sixth exception. Because the master overruled the defendant's "eleventh objection" to said draft report and found that defendant's statement, Exhibit X, was not entitled to credit in this accounting, whereas he should, upon the proofs, have given credit to the details of said exhibit.

Seventh exception. Because the master overruled the defendant's "twelfth objection" to said draft report, whereas he should have sustained said objection.

Eighth exception. Because the master overruled the defendant's "fourteenth objection" to said draft report as to the item "*a*" stated therein, to wit, $115, whereas he should have allowed said item.

294 Ninth objection. Because the master overruled the defendant's "seventeenth objection" to the said draft report as to the item "*b*" stated therein, to wit, "$58.33," whereas he should have allowed said item.

Tenth objection. Because the master overruled the defendant's "nineteenth objection" to the said draft report as to the items "*a*," $20.10; "*b*," "$306.72;" "*c*," "$260.00;" "*d*," "$130.66;" "*e*," "$65.66," and "*k*," "30.00," whereas he should have allowed all of said items, as requested by defendant.

Eleventh exception. Because the master overruled the defendant's "twenty-fourth objection" to the said draft report as to the item "*a*," "$20.50," whereas he should have allowed said item, as requested by defendant.

Twelfth exception. Because the master overruled the defendant's "twenty-seventh objection" to the said draft report as to the item —, $745, whereas he should have allowed said item, as was
295 requested by defendant.

Thirteenth exception. Because the master overruled the defendant's "twenty-ninth objection" to the said draft report as to all of the items therein stated, whereas he should have allowed all of said items except items "*n*" and "*v*," as was requested by defendant.

Fourteenth exception. Because the master overruled the defendant's "thirty-third objection" to the said draft report as to the items "*e*," "$224.62," and "*f*," "$11.90," and "*g*," "carbons," "$2,392.85," and "*h*," "carbons," "$4,629.68," whereas the master should have allowed such items upon the evidence before him.

Fifteenth exception. Because the master overruled the defendant's thirty-fourth objection to the said draft report by finding that the defendant's diamond-drill business during the accounting period in question was not an experimental or unremunerative business, but was a source of profit to the defendant, whereas he should have found that said business was experimental, unremunerative,
296 and was not a source of profit.

Sixteenth exception. Because the master overruled the defendant's "thirty-fifth objection" to the said draft report by finding that defendant's machines did not depreciate by use and wear during the accounting period and because he allowed nothing for such depreciation, whereas upon the evidence he should have found that said machines depreciated rapidly by use and wear over and above repairs, and that such depreciation amounted to at least $2,100.

Seventeenth exception. Because the master overruled the defendant's "thirty-sixth objection" to the said draft report by finding that defendant realized from the cutting business net profits which amounted to $6,474.42, whereas he should have found that defendant- did not realize any profits from their cutting business during said period.

Eighteenth exception. Because the master overruled the defendant's "thirty-seventh objection" to said draft report by finding that the burden of proof was upon the defendant to show 297
affirmatively the value of the diamonds *a′* in defendant's machines and the share of profits, if any, which equitably belonged to the complainant by virtue of defendant's use of the device *a′* of the second claim of the Leschot patent, whereas he should have found

that the burden of proof was on complainant to establish the value of the device in question in defendant's machines.

Nineteenth exception. Because the master overruled defendant's "thirty-eighth objection" to said draft report by finding that the said Leschot invented "a new rock-boring tool," whereas he should have found from the proofs before him that Leschot invented (if anything) an improvement in a rock-boring tool.

Twentieth exception. Because the master overruled defendant's
"thirty-ninth objection" to said draft report by finding that because
the defendant had not applied the infringing device to an
298 existing mechanism, but had used it in combination with a
newly organized mechanism designed to accomplish a class
of work to which the alleged infringing device had not been before applied, the burden of proof was shifted from complainant to defendant to prove the profits arising from the various inventions embodied in defendant's machines, with a view to showing the value of complainant's device *a'* in such machines, whereas he should have found that the burden of proof remained with complainant upon the state of the facts found by the master.

Twenty-first exception. Because the master overruled the defendant's "fortieth objection" to said draft report by finding that the infringing device in question was of value or advantage in defendant's machines, whereas he should have found it was of no value or advantage in defendant's machines.

Twenty-second exception. Because the master overruled defendant's "forty-first objection" to said draft report in finding that
defendant's novel and patented combinations in respect to
299 engine frame mounting, feed and reversing mechanisms, track
and spacing devices in the machines manufactured by defendant did not involve any vital invention, whereas he should have found from the proofs before him that said inventions were vital to the machines for the uses to which they were applied.

Twenty-third exception. Because the master overruled defendant's "forty-second objection" to said draft report in finding that there was no way of determining the relative advantage of the Leschot core bit and defendant's conical bit when applied to channel cutting and gadding, whereas he should have found that the core bit had never been successfully applied to these classes of work.

Twenty-fourth exception. Because the master overruled defendant's "forty-third objection" to said draft report in finding that the
cost of defendant's machines was to be reached by estimates,
300 whereas he should have found that such cost was to be reached
by the accounts produced and verified before the master by the defendant.

Twenty-fifth exception. Because the master overruled the "forty-fourth objection" to said draft report by finding that nothing should be allowed to the defendant from the profits arising from the sale of defendant's machines on account of the patented inventions belonging to defendant which were used in constructing such machines, whereas he should have found that all of such profits in equity belonged to defendant.

Twenty-sixth exception. Because the master overruled the "forty-fifth objection" to said draft report by finding that complainant's claim should embrace the entire profits realized by defendant on the machines, whereas he should have limited the claim to the infringing device as a part of the drill bit used by the defendant and to this device combined with a hollow drill rod.

301 Twenty-seventh exception. Because the master overruled the "forty-sixth objection" to said draft report in finding that the gains, profits, and advantages which defendant received from the presence of the Leschot invention on the machines made and sold by defendant between June 1, 1871, and November 24, 1874, amounted to $10,009.45, whereas he should have found that defendant received no gains, profits, or advantages from the presence in said machines by the said Leschot invention.

Twenty-eighth exception. Because the court having adjudged an infringement by defendant of a single feature only of complainant's alleged invention, to wit, the projecting diamonds *a′* (2nd claim) and the device *a′* in combination (3rd claim), the complainant should have produced evidence of the value of the device *a′*, and in the absence of such evidence the master should have found that the complainants were entitled to nominal damages only.

302 Twenty-ninth exception. Because the master has found that the Leschot tool was not simply an improvement upon the Hermann tool patented in France in 1855, but was "a new rock-boring tool," whereas he should have found upon the proofs and under the decree in this cause that the Leschot tool was simply an improvement upon the Hermann tool because it contained the projecting diamonds *a′*, which were not shown by Hermann.

Thirtieth exception. Because the master, at folios 164, 165, and 166 of his report, has obviously construed the alleged invention of Leschot not as it was construed by the court when the decree in this cause was passed.

Thirty-first exception. Because the master has misconceived and has misstated the invention of Hermann, as shown by the proofs before him.

Thirty-second exception. Because the master has not found, as he was requested to find, that the complainant had during the accounting period in question failed to make the Leschot tool a practical success, and that it still required on complainant's part the employment of the best mechanical talent and very large expenditures of money to make it a practical, useful, and valuable working tool. 303

Thirty-third exception. Because the master has disallowed defendants' claim, made in their accounting, for moneys for taxes, insurance, and for rent or for use of real estate and water-power, whereas he should have allowed such claims.

Thirty-fourth exception. Because the master has disallowed defendant's claim, made in the channel-cutting account, for interest upon the plant or cost or value of the machines used in that branch of the business, whereas the said claim should in equity have been allowed to defendant.

November 30, 1883.

(Signed) EDWIN T. RICE,
Solicitor & Counsel for Defendant,
61 *Liberty St., N. Y. City.*

304 (Endorsed:) U. S. circuit court, southern dist. of N. Y. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Defendant's exceptions to master's report. E. T. Rice, def't's solicitor, 61 Liberty St., N. Y. U. S. circuit court. Filed Nov. 30, 1883. Timothy Griffith, clerk.

305 U. S. Circuit Court, Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

To the honorable the judges of the circuit court of the United States for the southern district of New York:

The petition of the above defendant, The Sullivan Machine Company, respectfully shows:

First. That your petitioner is greatly aggrieved by an interlocutory decree made in this cause at a stated term of said court held on the 21st day of April, 1875, by the Honorable Nathaniel Shipman, who had before that time heard said cause, by which said decree it was, among other things, adjudged that your petitioner had infringed the second claim of the reissued patent therein named, granted to one Asahel J. Severance, assignee, on the 26th day of October, 1869, and numbered 3690, and whereby it was 306 referred to Edward G. Thompson, Esquire, as special master, to take and state and report to the court an account of the gains, profits, and advantages which the defendant had received or which had arisen or accrued to the defendant by reason of such infringement.

Second. That said decree was, upon complainant's motion, by order made by Judge Shipman April 26th, 1877, amended so as to adjudge that your petitioner had infringed the second and third claims of said reissued patent, and was thereafter, by order duly made and entered, further amended so as to substitute in said decree the name of S. A. Duncan, Esquire, as special master for and in place of the said E. G. Thompson, Esquire.

Third. That the accounting under said decree before the said S. A. Duncan, as special master, has been closed, and the master's report herein was filed in the office of the clerk of this court November 1st, 1883, and exceptions to said report have been filed both on the part of complainant and defendant; and this cause has been duly placed upon the calendar of the court to be heard on said exceptions to the master's report, but said exceptions have not yet been brought on for argument and final decree has not yet been passed or entered herein.

Fourth. That, as fully appears from the record in this cause, the original patent, of which the patent in question was a second reissue, was granted to one Rudolphe Leschot, of Paris, France, July 14, 1863; that in the specification appended to the original patent Leschot described his invention as follows, to wit:

"This invention consists in a boring tool composed of a series of diamond edges attached to an annular or tubular stock or
307 crown of steel or other metal, to which a rotary and a direct forward motion are given, and which is thereby caused to cut or bore an annular groove or hole, leaving a central core or kernel which is easily detached by the subsequent operation of a gad or wedge, the quantity of matter required to be removed by such boring tool being very small in proportion to the cavity which is formed after the withdrawal of the said kernel or core;" and the only claim of invention contained in said specification was in the following words: "What I claim as my invention and desire to secure by letters patent is the tool for boring or cutting rock or other hard substances, composed of an annular or tubular stock or crown armed with a series of diamonds, and operating substantially as herein specified."

Fifth. That an application for a reissue of said Leschot patent was first made in January, 1869, upon the petition and oath of one A. J. Severance, assignee, who obtained a reissued patent, dated February 17th, 1869, wherein the original claim of invention allowed to Leschot was abandoned, and, instead thereof, the claims of invention made and obtained by Severance by this reissue of the patent were as follows:

"What I claim as the invention of Leschot and desire to secure by letters patent is—

"1. A hollow rotating rock drill composed of a tubular boring bar, B, and a cylindrical crown or boring head, A, armed with diamond or other teeth $a\ a^1\ a^2$ when said drill is used in combination with a force pump, E, and connected with rotating machinery, substantially as and for the purposes set forth.

"2. The use of a stream of water when it is forced through a hollow rock drill by means of a force pump or other apparatus
308 which operates upon the same by means of mechanical pressure, substantially as and for the purposes set forth.

"(Signed) A. J. SEVERANCE."

Sixth. That thereafter, August 6th, 1869, and more than six years after the date of the original Leschot patent, the said Severance applied for a second reissue of said patent, and October 26th, 1869, he obtained the reissued patent upon which the said interlocutory decree was based, and by that reissue he obtained the following claims of invention, to wit:

"1. A continuously revolving and progressing boring head having projecting diamond points, in combination with a tubular boring bar, substantially as and for the purposes specified.

"2. The row of cutting edges a^1 when attached to a revolving boring head so as to project beyond the circumference thereof, for the purposes specified.

"3. In combination with a revolving and progressing boring head having cutting points projecting beyond the periphery thereof, a hollow central drill rod through which the water is forced or passed.

"4. A series of cutting edges, $a\ a^1\ a^2$, arranged in the face and upon the outer and inner peripheries, respectively, of a tubular or annular bit or boring head, A, substantially as and for the purposes specified."

Seventh. That authenticated copies of the contents of the "file wrappers" of the Patent Office in each of said applications for the reissue of the said Leschot patent form part of the record of
309 this cause, and it does not appear therefrom that the said
Leschot, the original patentee referred to, had any part in or had any knowledge or notice of either of said applications for the reissue of said patent, but it does appear therefrom that the said Severance either did not know or understand Leschot's invention as it was secured by his original patent or that he was fraudulently and in violation of law endeavoring to change and expand Leschot's single claim of invention.

Eighth. That it is obvious that the second claim of the second reissue of the Leschot patent was for a single element only of the tool originally claimed and patented by Leschot, and that the third claim of the reissue in question was for that single element of Leschot's tool, combined with a hollow boring rod—a device which formed no part of Leschot's original claim, and that these two claims materially changed and enlarged the scope of the Leschot patent, so that the tool used by your petitioner, which did not infringe the original claim of the Leschot patent, became an infringement of said second and third claims, as was determined and adjudicated by said interlocutory decree in this cause.

Ninth. That under the patent law of the United States, as recently construed by the Supreme Court, to wit, in Miller *vs.* Brass Company (104 U. S. R., 350), Mathews *vs.* Machine Company (105 U. S. R., 54), Bantz *vs.* Frantz (105 U. S. R., 160), Gage *vs.* Herring (107 U. S. R., 64), Clements *vs.* The Odorless Excavating Company (26 Official Gazette, 353), and numerous other recent decisions of the Supreme Court, the said second and third claims of the Leschot patent, upon which the interlocutory decree entered in this cause rests, are absolutely void.

Wherefore your petitioner prays that your honors will be
310 pleased to open or vacate said interlocutory decree and to
grant a rehearing of this cause.

And your petitioner will ever pray, &c.

Dated New York, February 4th, 1884.

(S'g'd) SULLIVAN MACHINE COMPANY,
Per E. T. RICE, *Att'y.*

(S'g'd) E. T. RICE,
Sol'r for Def't.

We, the undersigned, counsellors-at-law, do hereby certify that we have examined the foregoing petition and record in this cause and the recent decisions of the Supreme Court of the United States relating to the construction of claims of reissued patents, and we are of opinion that the interlocutory decree entered in this cause is, under said decision, erroneous, for the reasons stated in said petition, and that the prayer of said petition should be granted.

(S'g'd) HAMILTON MORTON,
E. T. RICE, *Counsel.*

(Endorsed:) U. S. circuit court, southern district of N. Y. In equity. The American Diamond Drill Company *vs.* The Sullivan Machine Company. Petition for rehearing. E. T. Rice, sol'r for def't, 61 Liberty St., N. Y. U. S. circuit court. Filed Feb. 4, 1884. Timothy Griffith, clerk.

311 Circuit Court of the United States for the Southern District of New York.

AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

SHIPMAN, *J.:*

In 1875 this court passed an interlocutory decree enjoining the defendant against the further infringement of the second claim of reissued letters patent No. 3690 to Asahel J. Severance, as assignee of Rudolph Leschot, dated October 26, 1869, for an improved rock drill. The original patent was issued to Leschot and was dated July 14, 1863. The interlocutory decree was subsequently modified so as to enjoin against the infringement of the third claim of the reissue. An accounting has been had before a master, whose report now comes for confirmation, and the case is ready for a final decree. Exceptions have been taken on both sides to the report, but all the exceptions are overruled, and the report is confirmed as containing a correct finding upon the questions which were referred to the master.

312 The important question is whether, under the recent decisions of the Supreme Court, the second and third claims of the reissue are valid, and whether the final decree should not be for a dismissal of the bill. (Perkins *v.* Fourniquet, 16 How., 321.)

The invention of the second and existing reissue and the infringing device were described in the opinion in the case of the American Diamond Rock-Boring Company against Sullivan Machine Company (14 Blatch. C. C., 119). The descriptive part of the original patent was substantially the same as the corresponding portion of the present reissue. The single claim of the original was as follows:

"The tool for boring or cutting rock or other hard substances, composed of an annular or tubular stock or crown armed with a series of diamonds, and operating substantially as herein specified."

The defendant's device had, instead of an annular boring head, a convex boring head armed with diamonds, and with two holes on its surface for the passage of water. By this device the entire portion of rock which is acted upon by the tool is abraded.

The second and third claims of the present reissue are as follows:

"2. The row of cutting edges a^1, when attached to a revolving boring head so as to project beyond the circumference thereof, for the purposes specified.

"3. In combination with a revolving and progressing boring head having cutting points projecting beyond the periphery thereof, a hollow central drill rod through which the water is forced or passed."

313 The plaintiff insists that Leschot's actual invention was a revolving and progressing boring head armed with cutting points projecting beyond its periphery, so that they will cut a hole of larger diameter than that of the boring head and drill and give a clearance, and a hollow drill rod adapted, by reason of its tubular form, to permit the injection of water through the orifice in the boring head to wash away the detritus; and, further, that Leschot described in the original patent the manner in which the diamonds were placed so that a larger diameter was given to the hole than that of the boring head. Both these positions are true. The plaintiff then says that the original claim did not limit the patent to an annular boring head, but expressly included a tubular one, so that a convex head was included in the patent as originally granted, and therefore that the new claims of the reissue are not an expansion of the original. The plaintiff understands the words "annular or tubular" to mean that the head may be annular, so as to leave a core, or tubular, so as to permit the passage of water, and that in any case the head must be tubular in a sense of a passage through it for the flow of water.

If the claim of the original patent did limit the invention, as patented, to an annular crown, which would necessarily bore an annular hole, leaving a central core, the plaintiff admits that the second and third claims of the reissue are an enlargement of the original patent, and, being contained in a reissue which was granted six years after the date of the original patent, are void.

The sole idea of Leschot when he obtained his original patent was that he had a tool which bored an annular groove, leaving a central core or kernel. He did not see that his invention was broader than his statement of it and could be made very useful for channeling or cutting from the quarry blocks of marble or rock by making
314 a series of holes which did not leave a core; but he presented
his invention to the Patent Office as one which had the single office, so far as its cutting character was concerned, of boring annular holes or grooves, and which was so constructed as to leave a central core within the hole or groove. He said, indeed, that the operation of his tool would be assisted by the injection of a stream of water through the tubular bar for the purpose of washing out the detritus, but this sentence or paragraph makes it plain that he considered that the chief function of the tubular crown was to make an annular hole

which should leave a core. The stock must be annular, and, being annular, it could admit a stream of water through the hollow bar. The claim of the original patent was not intended to enlarge the descriptive part of the specification, but to describe, compactly and tersely, the very invention which he had previously described more at length, and the words "annular or tubular" in the claim are synonymous, and were intended to convey the same idea which the patentee had expressed in the descriptive part of the specification. Therefore, if the patent was to include a convex boring bar and so include the actual invention, it must be reissued.

But the intent of the patentee having been to apply — and obtain a patent for an annular stock and not for a tool which did not leave a core, and the specification and the claim having been framed so clearly, accurately, and precisely to describe the annular tool and no other, there was in the original patent, according to the modern decisions, no error which had arisen through inadvertence, accident, or mistake, nor was there any defectiveness or insufficiency in the specification.

The interlocutory decree was right according to the theories of the law which were generally accepted in 1875; it is wrong as the law now stands.

315 The decree for dismissing the bill, for the reason herein set forth, will be settled, if desired, upon hearing.

Edmund Wetmore, for the plaintiff; E. T. Rice and Alvan P. Hyde, for the defendant.

(Endorsed :) Am. D. D. Co. *v.* Sul. Mach. Co. U. S. circuit court. Filed July 21, 1884. (Signed) Timothy Griffith, clerk.

316 At a stated term of the circuit court of the United States of America for the second circuit and southern district of New York, held at the court-house, in the city of New York, on the 18th day of August, 1884.

Present : Hon. Nathaniel Shipman, judge.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.
In Equity.

This cause coming on to be heard on exceptions to the master's report taken on behalf of both complainant and defendant, and upon petition for a rehearing of the cause filed by the defendant, and upon a hearing as to the final decree in the cause, and the said cause having been argued by the counsel for the respective parties, now, upon consideration thereof, it is found and is hereby ordered, ad-
317 judged, and decreed that the second and third claims of the
reissued patent named in the interlocutory decree heretofore made in this cause, granted to one Asahel J. Severance, assignee, on the 26th day of October, 1869, and numbered 3690, are each an expansion or enlargement of the claim of the original of said patent dated July 14, 1863, and are void.

And it is further ordered, adjudged, and decreed that the said interlocutory decree entered herein, dated April 21st, 1875, and the order amendatory thereof, dated April 26th, 1877, be, and the same hereby are, vacated and set aside.

And it is hereby further ordered, adjudged, and decreed that the complainant's bill of complaint herein be, and the same hereby is, dismissed with costs to the defendant as taxed, amounting to seventeen hundred and sixty-one $\frac{18}{100}$ ($1,761.18) dollars, and that the defendant have execution for such costs.

(Signed) N. SHIPMAN, *Judge.*

318 (Endorsed:) U. S. circuit court, southern district of New York. The American Diamond Drill Company, *vs.* The Sullivan Machine Company. Final decree. E. T. Rice, solicitor for def't, 59 & 61 Liberty St., N. Y. city. U. S. circuit court. Filed Aug. 20, 1884. Timothy Griffith, clerk.

318*a* Circuit Court of the United States for the Southern District of New York. In Equity.

THE AMERICAN DIAMOND DRILL COMPANY
vs.
THE SULLIVAN MACHINE COMPANY.

It is hereby stipulated between the counsel for the respective parties in the above case that the foregoing may constitute the record to be sent by the clerk of this court to the clerk of the Supreme Court of the United States on the appeal to said Supreme Court therein, and that the exhibits other than those transmitted herewith may be retained by the clerk of this court until the hearing on appeal in said Supreme Court.

New York, August 20th, 1885.

E. G. THOMPSON,
Solicitor & of Counsel for Compl't.
E. T. RICE,
Sol'r for Def't.

(Endorsed:) U. S. circuit court. Filed Oct. 16, 1885. Timothy Griffith, clerk.

318*b* Circuit Court of the United States, Southern District of New York. In Equity.

AMERICAN DIAMOND DRILL COMPANY
vs.
SULLIVAN MACHINE COMPANY.

It is hereby stipulated by and between the solicitors and counsel of the respective parties hereto that the copies of the testimony taken and stipulated as if taken before the master herein, as evidenced by the bound manuscripts marked by said master as follows, Books B, C, C′, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, T, and W, and the several exhibits referred to therein and making part thereof be forwarded to the clerk of the Supreme Court of the

United States as exhibits in this case, the same to be returned to the files of this court after final action by said Supreme Court upon this case.

New York, April 17, 1885.
(S'g'd) E. T. RICE,
318c *Sol'r for Def't,* 61 *Liberty St., N. Y. City.*
(S'g'd) E. G. THOMPSON,
Sol'r for Complainant, 4 *Pine St., New York City.*

Ordered accordingly.
June 10, 1885.
(Signed) HOYT H. WHEELER, *Judge.*

(Endorsed:) U. S. circuit court, southern district of New York. American Diamond Drill Company *vs.* The Sullivan Machine Company. Stipulation as to copies of testimony and order. Filed June 10, 1885.

319 United States Circuit Court, Southern District of New York.
In Equity.

American Diamond Drill Company
vs.
Sullivan Machine Company.

To the honorable the Supreme Court of the United States:

The appeal of the American Diamond Drill Company, the above-named complainant and appellant, respectfully showeth—

That upon the 25th day of September, 1872, the above-named complainant and appellant filed its bill in the circuit court of the United States for the southern district of New York against the above-named defendant and respondent, in which it alleged the invention by Rudolph Leschot of the improvements described and claimed in letters patent of the United States No. 39235, dated the 14th day of July, 1863, for an "improved rock drill," and the granting to said Rudolph Leschot, in due form of law, of the above-described patent therefor, the surrender by the said Rudolph Leschot, for good and lawful cause, of the said letters patent for "improved rock drill," No. 39235, and the issuance on the 26th day of 320 October, 1869, in due form of law, for the same invention of reissued letters patent No. 3690; the assignment of the inventions described and claimed in said letters patent No. 39235, and said reissued letters patent No. 3690 to the American Diamond Drill Company, the above-named complainant and appellant; the infringement by the defendant of said reissued letters patent No. 3690, and the damage and injury to the complainant resulting therefrom, together with the usual prayer for injunction and accounting.

That upon the 20th day of December, 1872, the above-named defendant filed its answer to said bill of complaint in said circuit court, wherein it admits the granting of said letters patent No. 39235, the surrender of the same, and the issuance of reissued letters patent No. 3690, but alleges that the said letters patent No. 39235 were not

properly the subject of reissue; deny that it was surrended for good and lawful cause, or that the said reissued letters patent No.
321 3690 were applied for or granted in due form or according to law, or that it was for the same invention as that embraced in said letters patent No. 39235, and alleges that the said reissue was obtained through fraud and misrepresentation and contained new matter not embraced in said letters patent No. 39235. It denies that the entire right, title, and interest in said letters patent No. 39235 and said reissued letters patent No. 3690 became vested in complainant by virtue of the above-mentioned assignment; denies that the said Rudolph Leschot was the original and first inventor of the improvements described and claimed in the said letters patent No. 39235 and said reissued letters patent No. 3690, but alleges that before his alleged invention thereof the same were patented in certain enumerated foreign patents, published and described in certain enumerated publications, and known to and used by certain persons mentioned, as appears more fully in said answer. It denies that the improvements described in said reissued letters patent were proper subjects matter for patents; denies that complainant is enti-
322 tled to any rights, interests, and privileges under said letters patent; denies infringement, and prays for a dismissal of the bill.

That on the 1st day of February, 1873, the complainant filed therein its replication in said court, and thereafter proofs on both sides were taken therein, as appears by the record.

That thereafter and on or about April 10th, 1875, said cause came on to be heard and was argued before his honor Judge Nathaniel Shipman, one of the district judges, sitting as judge of the circuit court for said southern district of New York.

That thereafter and on or about the 21st day of April, 1875, a decision was rendered by the said judge sustaining said reissued letters patent No. 3690 and adjudging that the defendant had infringed the second claim thereof; that on same day an interlocutory decree was entered, wherein it was adjudged and decreed, among other things, that said reissued letters patent No. 3690 were good and valid in law; that said defendant had infringed the said second
323 claim thereof, and that the complainant should recover of the defendant the profits, gains, and advantages which it had made by reason of such infringement, and that complainant recover from defendant its costs, &c., and that it be referred to Edward G. Thompson, Esquire, as master *pro hac vice*, &c.; and it was further ordered, adjudged, and decreed that a perpetual injunction be issued against the defendant according to the prayer of the bill.

That thereafter and on or about the 26th day of April, 1877, an order was entered, on motion of complainant and appellant, amending the said interlocutory decree, whereby the decree ordered, adjudged, and decreed, among other things, that the defendant had infringed the 2nd and 3rd claims of said reissued letters patent No. 3690, which said decree was in other respects the same as the said interlocutory decree above mentioned as of the 21st of April, 1875.

That thereafter, by consent of parties hereto, Samuel A. Duncan, Esquire, was substituted and appointed as master *pro hac vice* in the place and stead of Edward G. Thompson, Esquire.

324 That thereafter proceedings were had from time to time before said master, Samuel A. Duncan.

That thereafter and on or about the 10th of March, 1883, the defendant moved this court to rehear said cause and to vacate and set aside the two interlocutory decrees heretofore entered therein and to substitute therefor a decree dismissing the bill with costs upon the ground that said reissued letters patent were null and void; that his honor Judge Shipman temporarily denied the motion until the master should file his report; that on or about November 1st, 1883, the said master filed his report, to which exceptions were duly filed by both the complainant and appellant and by the defendant.

That thereafter and on or about the 9th day of April, 1884, the exceptions to said master's report were duly argued before his honor Judge Shipman, and at the same time the defendant renewed its motion to this court to rehear said cause and to vacate and set aside the two
interlocutory decrees heretofore entered therein and to sub-
325 stitute therefor a decree dismissing the bill with costs upon the
same grounds that said reissued letters patent No. 3690 were
null and void.

That thereafter and on the 20th day of August, 1884, his honor Judge Shipman filed an opinion on said motion and caused to be entered a decree dismissing said bill with costs to defendant.

That thereafter said costs were duly taxed in favor of defendant in the sum of one thousand seven hundred and sixty-one dollars and $\frac{18}{100}$ *cents*, and on or about the 17th day of March, 1885, a final decree was entered in accordance with the foregoing and awarding execution for the above costs.

Wherefore this appellant appeals from the said final decree and the whole thereof, and respectfully prays that the decree of the said circuit court and the bill, answer, pleadings, depositions, evidence, and proceedings in the said cause, both at final hearing and before the master, may be sent to the Supreme Court of the United States
without delay, and that the said Supreme Court will proceed
326 to hear the said cause anew; that the said decree of the said
circuit court may be reversed, the prayer of the bill herein be
granted, and the defendant ordered, adjudged, and decreed to pay to the complainant and appellant the amount found due by the master's report as filed, with interest thereon from the date of filing of the said master's report—that is, from the 1st day of November, 1883.

Appeal allowed.
(Signed) A. B.

EDMUND WETMORE,
EDWARD G. THOMPSON,
Sol'rs for Appellant.

(Endorsed:) Circuit court of the U. S., southern dist. of New York. In equity. American Diamond Drill Co. *vs.* Sullivan Machine Co.

Petition on appeal. Due service of the within petition on appeal admitted this 28 March, 1885, upon me both as solicitor for def't company and as a stockholder therein. (S'g'd) E. T. Rice, sol'r, etc. U. S. circuit court. Filed Mar. 30, 1885. Timothy Griffith, clerk.

327 U. S. Circuit Court, Southern District of New York. In Equity.

AMERICAN DIAMOND DRILL COMPANY
vs.
SULLIVAN MACHINE COMPANY.

Know all men by these presents that we, Charles H. Tompkins, of New Brighton, Richmond county, New York, and Aquila Rich, also of New Brighton, Richmond county, New York, are held and firmly bound unto the above-named Sullivan Machine Company in the sum of three thousand seven hundred and fifty dollars ($3,750), to be paid to the said Sullivan Machine Company; for the payment of which, well and truly to be made, we bind ourselves and each of us, our and each of our heirs, executors, and administrators, jointly and severally, firmly by these presents.

328 Sealed with our seals and dated the twenty-sixth day of March, in the year of our Lord one thousand eight hundred and eighty-five.

Whereas the above-named American Diamond Drill Company has prosecuted an appeal to the Supreme Court of the United States to reverse the decree rendered in the above-entitled suit by the judge of the circuit court of the United States for the southern district of New York:

Now, therefere, the condition of this obligation is such that if the above-named American Diamond Drill Company shall prosecute its said appeal to effect and answer all damages and costs if it fails to make good its plea, then this obligation shall be void; otherwise the same shall be and remain in full force and virtue.

(Signed) CHAS. H. TOMPKINS. [L. S.]
(Signed) AQUILA RICH. [L. S.]

Sealed and delivered and taken and acknowledged this twenty-sixth day of March, 1885, before me—

[NOTARIAL SEAL.] PHILLIPS ABBOTT,
329 *Notary Public, Kings Co., New York.*

Certificate filed in N. Y. Co.

UNITED STATES OF AMERICA,
Southern District of New York, } *ss:*

Charles H. Tompkins, being duly sworn, deposes and says that he is a householder in the State of New York and is worth the sum of three thousand seven hundred and fifty dollars over and above all his debts and liabilities.

(S'g'd) CHAS. H. TOMPKINS.

Sworn to before me this 26th day of March, 1885.
[NOTARIAL SEAL.] (S'g'd) PHILLIPS ABBOTT,
Notary Public, Kings County, N. Y.

Certificate filed in N. Y. Co.

330 UNITED STATES OF AMERICA,
Southern District of New York, } *ss:*

Aquila Rich, being duly sworn, deposes and says that he is a freeholder in the State of New York and is worth the sum of three thousand seven hundred and fifty dollars over and above all his debts and liabilities.
(S'g'd) AQUILA RICH.

Sworn to before me this 26th day of March, 1885.
[NOTARIAL SEAL.] (S'g'd) PHILLIPS ABBOTT,
Notary Public, Kings County, New York.

Certificate filed in N. Y. Co.

Approved as to form and substance and as to the sufficiency of the sureties, and may be filed and entered.
Dated M'ch 27, '85.
(S'g'd) E. T. RICE,
Def't's Sol'r.

(Endorsed:) U. S. C. C., S. D. N. Y. In equity. American Diamond Drill Co. *vs.* Sullivan Machine Company. The within
331 bond approved. (S'g'd) A. Brown. U. S. circuit court. Filed Mar. 28, 1885. Timothy Griffith, clerk.

332 By the Honorable Addison Brown, one of the judges of the district court of the United States, sitting as a judge of the circuit court of the United States for the southern district of New York, to the Sullivan Machine Company:

Whereas the American Diamond Drill Company has lately appealed to the Supreme Court of the United States from a decree lately rendered in the circuit court of the United States for the southern district of New York made in favor of you, the said The Sullivan Machine Company, and has filed the security required by law, you are therefore hereby cited to appear before the said Supreme Court, at the city of Washington, on the 12th day of October, 1885, next, to do and receive what may appertain to justice to be done in the premises.

Given under my hand, at the city of New York, in the southern district of New York, in the second circuit, the 28th day of March, in the year of our Lord one thousand eight hundred and eighty-five.

333 (Signed) ADDISON BROWN,
District Judge, Sitting as a Judge of the Circuit Court of the United States for the Southern District of New York.

(Endorsed:) Circuit court of the U. S., southern dist. of New York. In equity. American Diamond Drill Co. *vs.* Sullivan Machine Co. Citation on appeal. Edmund Wetmore, Edw'd G. Thompson, sol'rs for appellant. Due service of the within citation admitted this 28 M'ch, 1885, upon me, both as sol'r for def't company and as a stockholder therein. (S'g'd) E. T. Rice, solicitor. U. S. circuit court. Filed Mar. 30, 1885. Timothy Griffith, clerk.

334 UNITED STATES OF AMERICA,
Southern District of New York, } *ss:*

I, Timothy Griffith, clerk of the circuit court of the United States of America for the southern district of New York, in the second circuit, do hereby certify that the foregoing pages, numbered from one to three hundred and thirty-three, inclusive, contain a true and complete transcript of the record and proceedings had in said court in the case of The American Diamond Drill Company against The Sullivan Machine Company as the same remain of record and on file in said office.

In testimony whereof I have caused the seal of the said court to be hereunto affixed, at the city of New York, in the southern district of New York, in the second circuit, this 16th day of October, in the year of our Lord one thousand eight hundred and eighty-five, and of the Independence of the said United States the one hundred and tenth.

[Seal of U. S. Circuit Court, South. Dist. New York.]

TIMOTHY GRIFFITH, *Clerk.*

Endorsed on cover: S. New York C. C. U. S. No. 146. The American Diamond Drill Company, appellant, *vs.* The Sullivan Machine Company. Filed October 17, 1885.